

# Research Impact Booklet



[www.tus.ie](http://www.tus.ie)

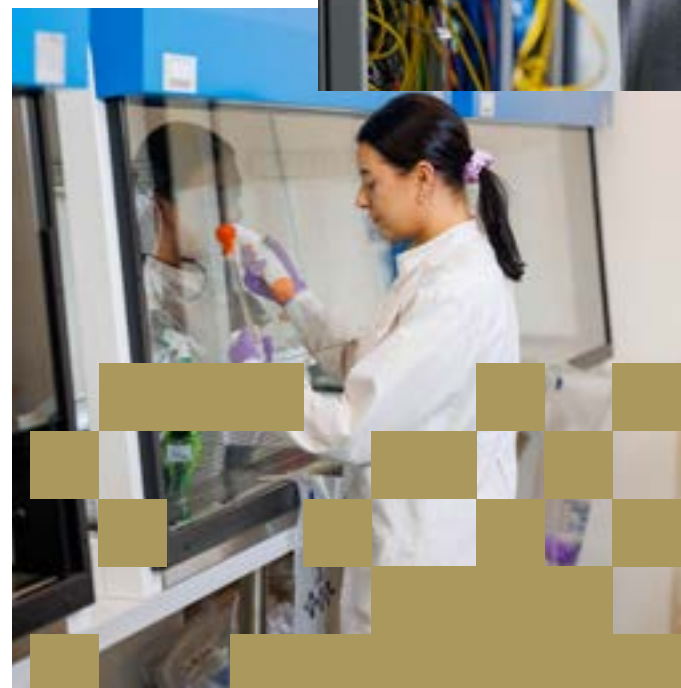
# TUS Research week

The inaugural Technological University of the Shannon (TUS) Research Week, takes place from 12 – 16 February, 2024. As part of the programme, 50 posters, 1 video from TUS and 4 posters and 1 video from our RUN-EU students have been developed by postgraduate students across the TU to showcase the university-wide practice of research.

The core ethos of TUS Research Week is to create an engaging platform, where the range of pioneering projects and initiatives from areas such as Science, Health, Creative Arts, Social Science, Engineering, Business, Hospitality and Technology are showcased to the wider student body, industry and beyond. By generating a culture of collaboration, stimulating creativity and fostering economic development, it creates real-world effects on a growing scale.

As an innovation-hub, TUS nurtures ideas and enables the bright minds of our research ecosystem to flourish. Our partnerships enable us to share our knowledge with the world, widen research impact and embed a research culture. Our strategy focuses on extending our reach and driving more significant transformation across our region and beyond.

TUS Research strives to deliver impactful applied research, grow our research community, engage in next generation thinking and tackle issues at a regional, national and global level.



# Creating the Future





## Factors influencing an employees ability to reduce their sedentary behaviour in a home-office context: An employers perspective

Alan Coffey, Iris París-Salomón, Pálvi Reckman, Malcolm Jones, Judit Bort-Roig, Karin Propper, Deirdre Walsh, Anna M Puig-Ribera, Anna M. Solé-Mix, Cristina Vagué-Crusellas, Kieran Dowd

### Introduction & Methods

**Introduction:** Office-based workers spend up to two-thirds of their daytime sedentary<sup>1</sup>. The Covid-19 pandemic resulted in a shift from office-based working to home-office working, or a hybrid of both. Recent evidence suggests that home-office working further increases sedentary behaviours compared to the office environment, which may have further deleterious effects on the health of employees unless addressed<sup>2</sup>. To successfully implement interventions that reduce sedentary behaviours while working from home, it is important to understand, from an employer's perspective, the factors influencing an employees ability to reduce their sedentary behaviours. The Click2move project aims to support active and healthy jobs in Europe by developing a co-created intervention to reduce sedentary behaviour in home-office workers.



**Methods:** Participants were recruited through an expression of interest form circulated via the European Network for Workplace Health Promotion and through personal communication with companies and social media. Semi-structured interviews were conducted, with all interviews recorded, transcribed and subsequently coded using MAXQDA and reflexive thematic analysis, guided by the COM-B model and the Behaviour Change Wheel, was performed.

### Results

**1. We're all in this together** – A top-down approach to interventions, whereby the organisation supports managers, is key in reducing the sedentary behaviours of employees. This support will give managers the confidence to lead by example in engaging in physical activity during work and encourage their employees to do so as well. As we progress away from the pandemic, managers feel that incorporating a social element to interventions will also help with engagement, particularly amongst those who otherwise may not be interested in physical activity.



**2. Give us the opportunity** – A lack of boundaries surrounding work hours whilst working from home appears to result in employees working longer hours and skipping lunch. In addition, the increase in online meetings and the open-access nature of online diaries now means employees have less control over their schedule, often resulting in back-to-back meetings, which automatically increases their sedentary behaviour. Lastly, the lack of distractions while working from home means employees become immersed in work and don't consider their sedentary time. Combined, these all reduce the opportunity for employees to reduce their sedentary behaviour whilst working from home.



**4. The invisible asset** – The initial fear from managers was surrounding the potential impact on profit of allowing their employees to reduce their sitting time. Despite this initial fear, managers genuinely want to support the health and well-being of their staff during work hours. Managers also felt that supporting the health and well-being of their staff would maximise their performance and ultimately the performance of the company long-term. This approach to employee well-being may also provide a competitive advantage over other organisations when looking to recruit new personnel.

**3. From risk prevention to health promotion** – The almost overnight shift from office-based work to home-office work meant organisations were reactive to the pandemic and their sole focus was on the health and safety of their staff and the financial survival of the company. Any interventions ran during this period were to support the mental health of their staff, due to the uncertainty of the pandemic, rather than focusing on reducing their sedentary behaviour. Now, as we move away from the pandemic and the infrastructure to support remote workers is a permanent feature, organisations are in a position to focus on health promotion amongst their employees working from home.



### Conclusion



Despite the unique isolated nature of working from home, a top-down approach with a high level of organisational support and management buy-in is needed to reduce the sedentary behaviours of employees. This top-down approach will allow for the policy changes that are also likely needed. Policies on structured work hours and meetings will create opportunities for employees to reduce their sedentary behaviours during work hours.

As we move away from the pandemic, organisations are now in a place to focus on interventions aimed at increasing the physical activity of employees. Improving the health and well-being of staff may benefit the performance of the company long-term.



### References

1. Prince, S.A., Elliott, C.G., Scott, R., Vinton, S. and Reed, J.L., 2019. Device-measured physical activity, sedentary behaviour and cardiometabolic health and fitness across occupational groups: a systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, 16(1), pp.1-15.
2. Fukushima, N., Machida, M., Kikuchi, H., Amegasa, S., Hayashi, T., Odagiri, Y., Takamiya, T. and Inoue, S., 2021. Associations of working from home with occupational physical activity and sedentary behavior under the COVID-19 pandemic. *Journal of Occupational Health*, 63(1), p.e12212.





## Defining Relational Safety Using the Delphi Method – Therapists’ Perspectives

Researcher: Aoife Ryan, TUS Limerick

### Introduction and Objective

Relational Safety is a somewhat abstract concept, yet most therapists and researchers in the area of psychotherapy agree on its importance for positive therapeutic outcomes.

The notion of ‘relationship’ and the ‘therapeutic alliance’ are present in much academic literature relating to the psychotherapeutic and counselling professions. Despite references to relational safety, Irish academic literature does not specifically define what this term ‘relational safety’ means in an Irish therapeutic setting.

This research goes some way towards filling the gap.

The main objective of this research is to bring forth a definition of what relational safety in a therapeutic setting means in an Irish context.



### Research Question

A literature review was undertaken in the first instance, which led to the identification of the research question. As there is little academic literature about the nature of relational safety, my study will focus on defining relational safety. This definition will consider relational safety from the perspective of therapeutic professionals, and highlight their understanding of relational safety in therapeutic relationships. See Figure 1 below.

Figure 1: Research Question

What is the meaning/definition of relational safety in a therapeutic setting?



### Methodology

The Delphi method of analysis (Figure 2) was used in this research and is suited to exploring areas of research where controversy, debate or lack of clarity exist. The method is used as a means of generating consensus and/or measuring opinion (Hasson, Keeney and McKenna, 2000). The Delphi method was developed originally as a business model of analysis, and originated in RAND corporation during the 1950s. It is an “iterative multistage process, designed to transform opinion into group consensus” (Hasson, Keeney and McKenna, 2000, pg. 1008).

My research is particularly qualitative in nature, and I wanted to utilise a method that would reflect the depth and richness of data being collected, and that involved a level of reflexivity, to best answer my research question. To this end, I have adopted a modified qualitative Delphi approach, that was developed by Dr. Sekayi and Arlene Kennedy (Sekayi and Kennedy, 2017).

Braun and Clarke’s (2022) reflexive thematic analysis was used at each stage of data analysis.

Figure 2 - Qualitative Delphi Process



### Work Summary

#### Work undertaken to date:

##### Literature Review and Research Question:

- A strategic review of the literature
- Identification and construction of research question
- A review and analysis of methodological literature; specific focus on the Delphi method
- Preparation and submission of ethical proposal
- Continuing research of the literature relating to relational safety and therapeutic relationships

##### Research Design and Methodology:

- Design of the research study, including questionnaire, consent forms, information sheets, and participant recruitment plan (online qualitative tool and focus groups)
- Review of literature on data analysis
- Dissemination of online qualitative tool and data analysis of same
- Online focus groups conducted
- Transcription and data analysis of focus groups
- Dissemination of narrative statements for participant endorsement
- Analysis and refinement of the data and statements
- Conclusions and definition formation
- Participant endorsement of final definition

#### Work to do:

- Write up findings



### Findings

This research was designed to elicit a definition of the meaning of relational safety in therapeutic spaces. Each round of the Delphi study produced individual themes that informed following rounds. The data obtained was rich and nuanced and resulted in the production of fifteen statements for participants to endorse. Following further analysis and clarification from participants a final consensus definition will be drafted, that is fully endorsed by participants.

#### Significant participant quotes:

- “relational safety is so unspoken, it’s a feeling, it’s a sense of common humanity”
- “I need to be brave”
- “It’s the felt sense, it’s massive, it’s core for everything”
- “There is a compassionate focus in the relationship, that’s fearless as well, you know, not just compassion, but able to challenge and accompany and take risks”
- “It’s something I was never taught ... it’s something we learn to nurture within ourselves”
- “psychological safety and relational safety are definitely different”
- “It’s a multi layered process”
- “I think relational safety needs to go far beyond being a therapeutic term, it needs to be an everyday term”
- “The relational safety in my client will only come, when there is relational safety within me”
- “A therapist’s own relationship with self and consciousness is hugely important”
- “It is touching in with our own humanity”



## Exploring Trauma Literacy Among Early Childhood Education and Care Professionals in Ireland Protecting the Future

Caitriona Mc Mahon Cooley KD0224152

Supervisors: Dr Geraldine Maughan & Cathy Jones

### Title

What factors contribute to the creation of trauma-informed Early Childhood Education and Care Professionals?

### Introduction

This study explores trauma literacy among Early Childhood Education and Care professionals (ECEC) in Ireland. A central aim is to identify potential gaps that may or may not exist in education, understanding, and awareness in terms of trauma literacy among ECEC professionals, examining what factors assist in the creation of trauma literacy professionals in Ireland and what the research as a central research question.

**Research aims:**

1. To explore with Irish Early Childhood Education and Care professionals the most useful approaches to facilitate responses to children that face or are experiencing trauma.
2. To build on existing trauma-informed research and practice within the Irish Early Childhood and Care sector and develop in-depth practical knowledge which can be applied to professional practice, services, and policy.
3. To explore international ECEC trauma-informed literature and frameworks to better understand Ireland's position internationally.
4. To explore opportunities, evidence-based approaches to build on trauma literacy within Irish Early Childhood Education and Care settings.
5. To explore the factors that contribute to becoming a trauma-informed Early Childhood Education and Care Professional.
6. Synthesise new knowledge to inform future education, practice, educational programs, and policies.

### Overview

Despite growing literature in support of understanding the impact of trauma in early childhood internationally, a gap exists in recognizing the potential role ECEC professionals could play in leading to the health of these children (Cassidy, 2018; Barrett and Smith, 2020). Although some children learn and live in safe environments, other children experience trauma and adversity (Joshi et al., 2015). Trauma impacts and disrupts learning, memory, attention, focus, problem solving, sequencing, language development, and self-regulation (Dodge & Wain, 2016). Early Childhood Education and Care professionals have been highlighted as being in an advantageous position to provide vital support to children who have experienced trauma (Cassidy, 2018).

A child's trauma also has implications for caregivers and teachers. One study demonstrated that ECEC professionals' psychological well-being was negatively affected based on the average level of child externalizing behavioral problems in the classroom, hence predicting levels of staff stress (Friedman et al., 2014). Similarly, a link has been made between ECEC professionals' emotional exhaustion and preschooler's behavioral problems (Joshi et al., 2016). This issue is not only limited to ECEC professionals, but it also impacts positive teacher-student interactions (Dodge, 2007).

The core principles of trauma-informed care align greatly with those of Early Childhood Education and Care Practice (ECEC) early (2020). Trauma-informed care education in Ireland is currently offered as an optional add-on for postgraduate students and professionals wishing to pursue continuing professional education (CPE) or short-term courses up to a maximum of one year. Little emphasis has to date been placed on the practitioner as a link in the trauma-informed care process. Uniquely this research focuses on and highlights the required practitioner professional personal development, trauma-informed undergraduate training and the professional's trauma literacy (Dodge et al., 2011, p.276). This novel approach focusing on the professional as a link will build upon current trauma-informed care models.

### Data Collection & Analysis



Semi-structured interviews will be used as a qualitative data collection method. Data will be analysed using reflexive thematic analysis (Crab & Clark, 2021). Additionally, a desktop analysis of international early years ECEC trauma-informed literature will be conducted. ECEC professionals practicing in Ireland and international experts will complete interviews.

Semi-structured interviews are the most frequently used format interview in the social sciences (Pentney & Nantus, 2012). Participants will be encouraged to share their experiences, and any events that catch interest and to reveal their attitudes and opinions (Crab & Clark, 2021, p.266). Beyond referred to these interviews as 'conversations with purpose' (Bryman, 1994, p.302). Semi-structured interviews have a gap for researchers to explore contextual information that are clear in the narratives but that are not always obvious (Gillies, 2017, p.3).

### Potential Outcomes

- To determine the factors that contribute to becoming a Trauma-Informed Early Childhood Education and Care Professional in Ireland.
- The generation of new practice-based knowledge with the potential to inform future interventions, policies, practice and educational programmes.
- Examining what, if anything, from a professional's tacit knowledge offers a role in trauma-informed practice.
- Establishing Ireland's position within an international trauma-informed care context.

### Disseminations

- Presented at the National Academic Research Symposium Annual Lecture (08.10.2021)
- Accepted oral rapid presentation at the National Academic Research Symposium Annual Lecture (08.10.2021)
- One of 30 professionals that called for change in the sector and Early Years Ireland website (11.10.2021)
- Presented at the Research & Innovation Symposium - Annual Trauma Informed Research event (10.10.2022)
- External virtual consultation panel member: 'Six Years' National Practitioner (19.10.2022)
- Presented at the National Teacher Education Conference (20.11.2021)
- Presented at the Trauma Informed Care event (09.06.2021)
- Presented at the TUS Alumni Series Talk (20.11.2021)

**References**

Barrett, M. & Smith, S. (2020). Trauma-informed care in early childhood education: A review of the literature. *Journal of Child Psychology and Psychiatry*, 61(12), 1611-1621.

Cassidy, E. (2018). Trauma-informed care in early childhood education: A review of the literature. *Journal of Child Psychology and Psychiatry*, 59(12), 1611-1621.

Dodge, K. A. (2007). Trauma-informed care in early childhood education: A review of the literature. *Journal of Child Psychology and Psychiatry*, 48(12), 1611-1621.

Dodge, K. A., & Wain, J. (2016). Trauma-informed care in early childhood education: A review of the literature. *Journal of Child Psychology and Psychiatry*, 57(12), 1611-1621.

Friedman, M. S., & Wain, J. (2014). Trauma-informed care in early childhood education: A review of the literature. *Journal of Child Psychology and Psychiatry*, 55(12), 1611-1621.

Gillies, M. (2017). Trauma-informed care in early childhood education: A review of the literature. *Journal of Child Psychology and Psychiatry*, 58(12), 1611-1621.

Joshi, A., & Wain, J. (2015). Trauma-informed care in early childhood education: A review of the literature. *Journal of Child Psychology and Psychiatry*, 56(12), 1611-1621.

Crab, C., & Clark, J. (2021). Trauma-informed care in early childhood education: A review of the literature. *Journal of Child Psychology and Psychiatry*, 62(12), 1611-1621.

Pentney, S., & Nantus, J. (2012). Trauma-informed care in early childhood education: A review of the literature. *Journal of Child Psychology and Psychiatry*, 53(12), 1611-1621.

Dodge, K. A., & Wain, J. (2016). Trauma-informed care in early childhood education: A review of the literature. *Journal of Child Psychology and Psychiatry*, 57(12), 1611-1621.



# A comparison of the mechanical properties of FFF, APF and, IM processes using PC/ABS

Dept. of Mechanical, Polymer Engineering & Design

Researcher: Caolan Jameson

Supervisors: Dr. Noel Gately, Dr. Declan Devine and Gavin Keane

## Introduction

Traditional approaches to manufacturing polymer components such as injection moulding (IM) provide a robust and quick processing method. However, there is a high cost associated with IM. Additive Manufacturing (AM), commonly known as 3D printing, is comprised of a wide range of processing techniques such as Fused filament fabrication (FFF). Arburg plastic freeforming (APF) is an AM technique which uses droplet deposition modelling to form 3D printed components layer by layer [1], [2] while FFF uses a filament of known diameter.

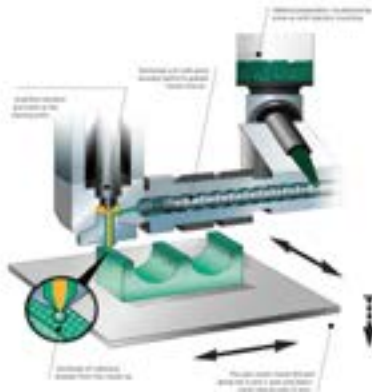


Fig.1 The APF process [2]

While FFF printing polymers can allow design flexibility, polymers are typically weaker due to the inability to provide a 100% dense part, due to voids occurring between layers as shown in the SEM image of a FFF printed part below.

## Materials & Methods

### Materials

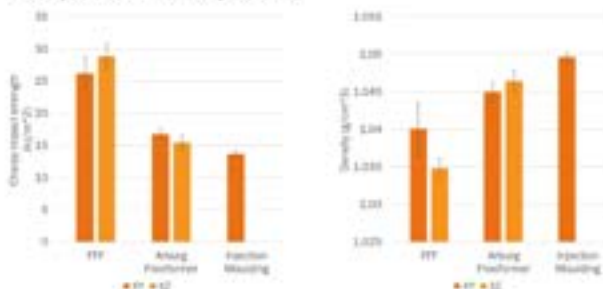
A blend of Polycarbonate (PC) and acrylonitrile-butadiene-styrene (ABS) filament was supplied by RS components. For tensile, impact and, flexural testing, samples were manufactured to ASTM D638-14 type I, D6110-10 and, D790-10 specifications respectively. These samples were printed individually in XY and XZ orientations.

### Methods

Samples were manufactured using BCN3D Sigmax R19 FFF printer, an Arburg Allrounder injection moulding machine (IM) and the Arburg plastic Freeformer (APF).

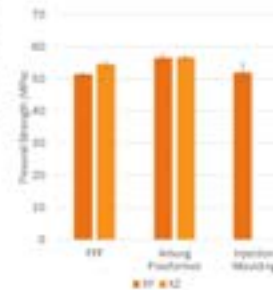
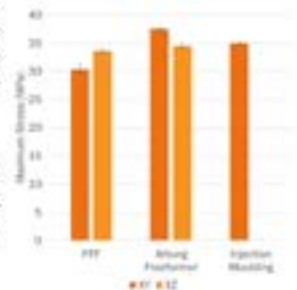
## Results pt. 1

- Samples manufactured using the FFF process achieved a significantly lower density compared to any other process.
- The lower density was due to porosity in the part which can be seen in the SEM image of the FFF XY sample.
- This porosity aided in the increase in Charpy impact strength when compared to the other processes.



## Results pt. 2

- The ultimate tensile strength (UTS) obtained by the APF in the XY orientation obtained significantly higher tensile strength than any other process/orientation.
- The FFF process obtained the lowest tensile strength of the three machines which was a result of poor layer adhesion which can be seen in the SEM image.



- The lower flexural strength of the IM samples may have been influenced by the rapid cooling of the samples.
- Unlike IM, the FFF and APF process allow the part to slowly cool down, reducing the internal stresses of the sample.

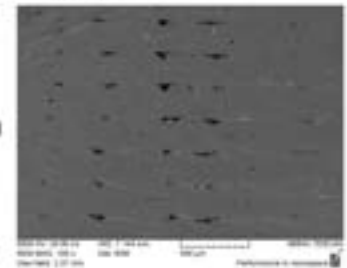


Fig.2 SEM image of FFF sample in XY orientation

- The porosity shown in the SEM image is present for both FFF sample orientations, however it is not as prominent in the APF samples

## Conclusion

This study compared the mechanical properties of PC/ABS components manufactured via APF, FFF and IM. Each manufacturing process exhibited unique characteristics, strengths, and weaknesses. While the FFF samples had superior impact strength of the three manufacturing processes, the APF had the best tensile and flexural strength. The use of injection moulding grade PC/ABS would have been a better comparison for IM however the FFF process wouldn't make consistent parts

## References

- [1] N. B. Webb, R. K. Malcolm, B. Devlin, and P. Boyd, "Dapivirine-releasing vaginal rings produced by plastic freeforming additive manufacturing," *Int. J. Pharm.*, vol. 572, Dec. 2019, doi: 10.1016/j.ijpharm.2019.118725.
- [2] S. Pollack et al., *Polymer-Based Additive Manufacturing*. Cham: Springer International Publishing, 2019.



The Applied Polymer Technologies Gateway (APT) is co-funded by the Government of Ireland and the European Union through the ERDF, State Research & Innovation Program, 2014-2020. 1021-27



**TUS**  
Technological University of the Shannon  
Midlands Midwest  
Oifigeoil Teicneolaíochta na Gaillimhe  
Lár Tíre Iarthair Lár

**TUS Research**



## Low-Cost 3D Printing and its application in a Learning Environment- perceptions and perspectives of staff at an Irish University.

Student: Eamonn O'Shea  
 Supervisor: Romina Pezzolli

### Research Questions:

What are the perceptions and perspectives of staff on Low-Cost 3D Printing (Additive Manufacturing) and its application in a learning environment at an Irish University?  
 How can 3D Printing be integrated into a learning environment to develop products for the smart Products department at an Irish University?

### Methods

There are two separate elements of the methodology section  
 Firstly, the integration of 3DP into a learning environment.  
 Secondly, the perceptions and perspectives of staff of low-cost additive manufacturing in a learning environment.  
 The integration of 3DP into a learning environment is explained through a case study of some of the products integrated into a learning environment (a 3D-printed Mars rover replica and an enclosure to house a SAMD21 microcontroller).  
 The second element of this study is a detailed quantitative questionnaire/survey which is used to gain knowledge of staff perspectives and perceptions of low-cost additive manufacturing in a learning environment.

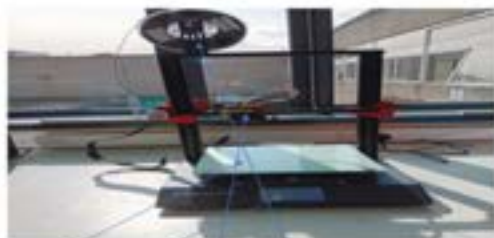
### Expected Outcomes

This study will complement the current body of work on Additive manufacturing and its applications in an educational setting. This research will also be the first to examine how 3DP was integrated into the manufacturing of products at an Irish University. This will help address Irish university staff's current perceptions and perspectives and demonstrate how 3DP was integrated into a learning environment.

### Background information on 3D Printing

3D Printing describes a range of technologies that digitally fabricate three-dimensional objects on an additive layer-by-layer basis.  
 The two leading technologies currently used in an educational setting are fused deposition modelling and stereolithography.  
 Fused Deposition Modelling (FDM) 3D printing, also known as fused filament fabrication (FFF), is an additive manufacturing process where molten material is extruded through a hot nozzle at temperatures ranging from 190 degrees Celsius up to 300 degrees Celsius depending on the material being used. FDM builds parts layer by layer by selectively depositing melted material in a predetermined path. It uses thermoplastic polymers that come in filaments to form the final physical objects.  
 Stereolithography belongs to a family of additive manufacturing technologies known as vat photo-polymerisation, better known as resin 3D printing. These machines are all built around the same principle, using a light source—a laser or projector—to cure liquid resin into hardened plastic. The primary physical differentiation lies in the arrangement of the core components, such as the light source, the build platform, and the resin tank.  
 (Stereolithography (SLA) 3D Print, 2023)  
 A typical Fused Deposition Modelling printer is shown in Figure 1.

Figure 1: Typical FDM printer.



Hotplate, Linear extruder, Hot wind, Filament spool

### Key Literature

At an IEEE conference in Porto Portugal in 2020 " Global Engineering Education Conference (EDUCON)"  
 (Assante, et al.2020) discuss "3D Printing in Education: A European Perspective"  
 At a conference in 2019, "Advances in Science and Engineering Technology International Conferences (ASET Advances in Science and Engineering Technology)"  
 The following paper was reviewed: "Boosting Teaching Experience in Mechanical Engineering Courses Using Additive Manufacturing Technologies (Alternat, 2019)"  
 The following article was printed in the Journal "3+1 Web of Conferences"  
 Build an Integrated Scene Teaching System for Additive Manufacturing Based on the Integration of Production and Education (Wen, 2023)  
 References  
 Wen, Z. a. (2023). Build an Integrated Scene Teaching System for Additive Manufacturing Based on the Integration of Production and Education. *3+1 Web of Conferences*.

aiQtp. (2024). The 10 Best 3D Printers for Schools in 2023. Retrieved from best-3d-printer-for-school-education: [https://aiqtp.com/10-best-3d-printer-for-school-education/#utm\\_source=makerbot-sketch-large](https://aiqtp.com/10-best-3d-printer-for-school-education/#utm_source=makerbot-sketch-large)

Alfenead, I. M. (2019). Boosting Teaching Experience in Mechanical Engineering Courses Using Additive Manufacturing Technologies. 2019 Advances in Science and Engineering Technology International Conferences (ASET) (pp. 01-06). Dubai, United Arab Emirates: IEEE.  
 Assante, D. a. (2020). 3D Printing in Education: an European perspective. IEEE Global Engineering Education Conference (EDUCON) (pp. 1135-1136). Paris, Portugal: IEEE.  
 Stereolithography (SLA) 3D Print. (2023). Retrieved from institute of Chemical Physics N4S IFA. <https://icph.ifa.cn/devices/stereolithography-sla-3d-print-3d/>

### 3D Printed Mars Rover Replica

Photo credit: Tom, before construction, photographing with video camera, Youtube



Photo credit: Eamonn, showing features, these include, great sensor and motor mounting points, also body has primary, additional



Completed product 3D printed enclosure to hold a SAMD21 microcontroller





# Investigating the Impact of Sporting Role Models on Female Adolescent Sport Participation and Physical Activity Levels

PhD Student: Eimear Kelly

Supervisors: Dr Aoife Lane<sup>1</sup>, Dr Katie Lister<sup>2</sup>, Dr Kieran Dowd<sup>2</sup>

1. Department of Sport and Health Sciences, SHE Research Group, TUS Midlands
2. School of Sport, Ulster University

**Background**  
Among adolescents there is a notable decline in physical activity (PA) levels from childhood, more notable among females than males (Bull et al., 2020). Sport is recognised as a key tool in promoting PA, however sport participation is higher among young males than females (Woods et al., 2023).  
Visibility is a common cornerstone strategy to promote engagement in PA and sport, and sporting role models (SRMs) are regularly used to promote participation (Sport Ireland, 2016).  
Boys are more likely to choose a SRM than girls and girls are more likely to choose female SRMs than males (Young et al., 2015). Male SRMs are typically chosen based on being strong, physical, masculine and successful on the field of play, whereas female SRMs are chosen due to success in sport and career achievements, being caring and socially successful (Hargreaves, 2002).  
While there is a strong policy context for SRMs in sport in Ireland worldwide, there is a lack of empirical evidence (MacCallum & Robinson, 2002; Payne, 2002; Lyle, 2009; Kelly et al. 2023) for a role model effect as well as critical questions regarding the assumption of trickle-down effects in sport development more generally.

## Aim of Study

### Phase 1

Review of SRM-led interventions that target PA and/or sport participation (SP) levels among female youth to determine (a) the design of the program, (b) the impact on SP/PA, and (c) provide recommendations for future SRM programs in research, policy, and practice.

### Phase 2

Quantitative, descriptive study to understand the:  

- Prevalence of SRMs Among Irish Youth
- Relationship between SRMs and PA/SP.

### Phase 3

Qualitative study to explore the perspectives of key stakeholders on the role/function of SRMs in maintaining or increasing participation in sport/PA among young female camogie players.

### Phase 4

Design, deliver and evaluate an intervention to understand the impact of an SRM led programme on the perceptions and participation of sport among Irish adolescent females in a Gaelic Games context.

## Methods

### Phase 1

**Study Review**  
**Data Collection:** Search of peer reviewed articles using SportsDiscus (N=6,977), PubMed (N=110) and APA psychInfo (N=82).  
 Grey literature programmes were identified using Google search engine, direct contact with relevant sporting organizations and with authors who had written about role models.  
**Analysis:** Inclusion Criteria: participants were females and u18 years, study included an SRM intervention or element articles were published in English.  
 PRISMA approach to screening 7,169 peer reviewed articles and 45 grey literature programmes.

## Results

### Phase 2

**Summary of findings**  
 One peer-reviewed (Amour&Duncombe, 2012) article was included.  
 Overall, the results of the study showed positive experiences summarised in 5 themes: inspiration, changed attitude, improved future, feeling special, and enhancing the original programme that did not include elite athlete visits.  
 Effects on literature programmes were included.  
 At the time of the review, eight of the programs are reported to be currently running, five in Ireland, one in America, one in New Zealand, and four in Australia, in addition to one international program based in the United States.  
 All included programmes were assessed using Downs and Black's Quality Assessment Tool and deemed of poor quality.

### Phase 2

**Summary of findings**  
 Sports stars, dads, coaches and friends were among the most prevalent sporting role models selected across males and females.  
 Sports stars was the most popular. Among sports stars, there was a trend in similarity between the youth and the sports star in terms of gender, sport played and Nationality (for females).  
 There was a consistently significantly strong relationship between being very likely to choose a sports star sporting role model and daily PA levels, higher sport participation frequency and having a club membership.

### Phase 3

**Study Qualitative Study**  
**Participants:**  
 1. Adolescent Focus Groups: 5 groups (12-16 years), one from each Irish province and Dublin (N=35)  
 2. Athlete Focus Group: intercounty female athletes from each Irish province and Dublin (N=5)  
**Recruitment:**  
 Contact relevant club secretary & u14 team manager  
 Online focus groups with researcher and research assistant.  
**Analysis:** Thematic Analysis using NVivo Software.

## Phase 4 Intervention Design and Delivery

Key Take Away's from Phase 1-3



1. Use a theoretical framework (Mogensen's Motivational Theory of Role Modelling and the Behaviour Change Wheel).
2. Implement evaluation framework from the design phase.
3. Include adolescents in design phase.
4. Consider level of role model and adolescent interaction.

## Conclusions

- Female sport is progressing in terms of media coverage and accessibility in recent years.
- Policy has considered the use of role models as a medium to increase participation in sport and PA and inspire the next generation.
- Little quality evidence exists to show an impact of sporting role models on SP and PA.

## References



## Acknowledgements

TUS President Doctor Scholarship



## Response Surface Modelling: Nafion-117 Sorption of Tetraammineplatinum(II) Chloride in the Electroless Plating of IPMCs

Eyman Manaf<sup>1</sup>, Clement L. Higginbotham<sup>2</sup>, John G. Lyons<sup>1</sup>

<sup>1</sup>Faculty of Engineering & Informatics, Technological University of The Shannon: Midlands Midwest

<sup>2</sup>Materials Research Institute, Technological University of The Shannon: Midlands Midwest

**Introduction:** Ionic polymer-metal composites (IPMCs), another moniker for them being artificial muscles, are a subset of electroactive polymers known for their sensing and actuating abilities [1-2]. Its structure involves a thin film polymer (Nafion-117) sandwiched in-between metal electrodes (platinum). The conventional and preferred chemical manufacturing method of IPMCs is through electroless plating. One of the stages involved in the plating process is the soaking of Nafion-117 films in solutions of tetraammineplatinum(II) chloride (Pt-Ammine) to allow for sorption of the platinum particles before chemical reduction. However, the effects of process parameters on the sorption process is still not fully understood. This work explores the application of response surface modelling to characterise how concentration of Pt-Ammine, soak time, pH and temperature affect sorption amount.

**Methodology:** Two sets of design of experiments were carried out in this study; a definitive screening design (DSD) followed by a central composite design (CCD). The screening design indicated that the four factors: concentration of Pt-Ammine, soak time, pH and temperature, were significant factors worth to be further explored through response surface modelling.

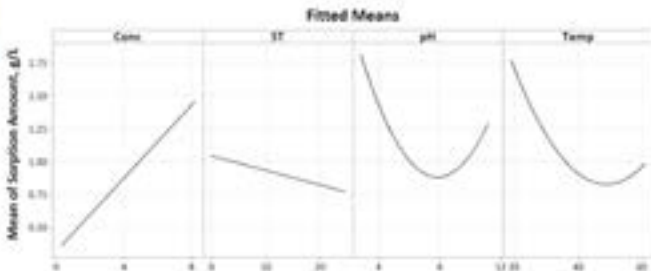
**Results and Discussion:** The RSM resulted in the regression model as shown below. However, the low R<sup>2</sup> value suggests a quadratic model is not adequate to model the complex interactions between the four factors and how it affects sorption amount.



| Uncoded Regression Equation                                     | R <sup>2</sup> (%) |
|---|--------------------|
| 3.22 + 0.498 Conc + 0.0580 ST - 0.378 pH - 0.1003 Temp          | 49.09              |
| -0.0110 Conc*Conc + 0.0355 pH*pH + 0.001021 Temp*Temp - 0.00677 |                    |
| Conc*ST - 0.0260 Conc*pH - 0.00575 ST*pH                        |                    |

DSD and CCD Factor Configurations

| Factors                    | Units | Notation | Factor Levels |      |
|----------------------------|-------|----------|---------------|------|
|                            |       |          | Low           | High |
| Concentration of Pt-Ammine | g/L   | Conc     | 0.5           | 8    |
| Soak Time                  | hours | ST       | 0.5           | 24   |
| pH                         | -     | pH       | 3             | 11   |
| Temperature                | °C    | Temp     | 20            | 60   |



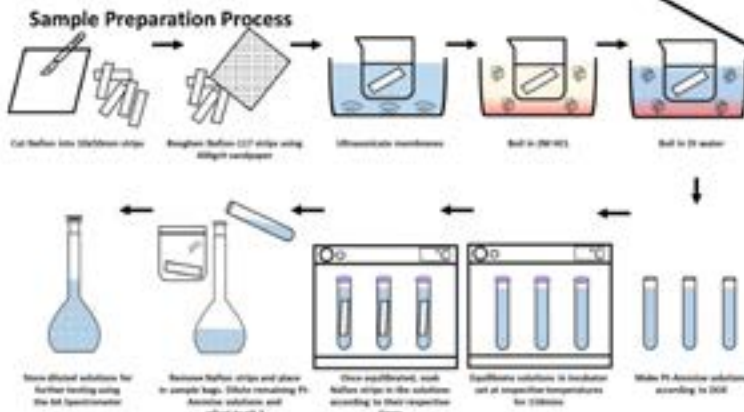
Sorption amount was quantified through atomic absorption spectroscopy (AAS) using a Varian AA240FS, measured at wavelength 265.9nm. An air/acetylene mixture was used, set to 13.5 L/min and 2.0 L/min respectively. Lamp current was set to 5 mA, with measurement time and pre-read delay set to 5 s.

**Concentration:** increase in concentration gradient increases sorption amount

**Soak Time:** maximum sorption followed by desorption as soak time increases

**pH:** sulfonate acid (SO<sub>3</sub>H) sites have a higher affinity for higher valency ions as well as a preference for metal cations as compared to protons [2,3-4]

**Temperature:** steep decline in sorption amount with temperature indicates a physisorption mechanism between the Pt-Ammine ions and SO<sub>3</sub>H sites in the Nafion, in line with literature [3,5]



**Conclusion:** The poor fit of the RSM model in this study indicates the presence of more complex interactions when considering concentration, soak time, pH and temperature simultaneously in the sorption of Pt-Ammine in Nafion-117 films. A higher order model (cubic or quartic) is needed to better fit the data and better characterise the complex interactions.



### ORCID AUTHOR INFO



**Eyman Manaf** is currently a 4th year Polymer Engineering PhD student at TUS specialising in the manufacturing of Ionic Polymer-Metal Composites (IPMCs). His research encompasses the fields of organic chemistry, inorganic chemistry, chemical synthesis and computer vision. His slow descent into madness has worsened recently as he tries to wrap up his PhD and graduate.

### References

[1] Y. Bai-Lin, H. H. Gao, J. Wang, and S. Gao, "Preparation of electroactive polymer on carbon," in *Advanced Materials Research*, vol. 1, pp. 1-4, Trans Tech Publ, 2011.

[2] A. S. Ganga and A. S. Varma, "New insight into functionalized carbon-based materials," *Chem. Rev.*, vol. 117, no. 1, pp. 891-939, Feb. 2017, doi: 10.1021/acs.chemrev.6b00100.

[3] M. M. Manaf and A. S. Varma, "Sorption of tetraammineplatinum(II) chloride on Nafion-117 membranes," *Electrochim. Acta*, vol. 206, no. 2, pp. 477-482, Jul. 2016, doi: 10.1016/j.electacta.2016.02.050.

[4] M. M. Manaf, M. Ghaffar, and A. S. Varma, "Sorption behavior of platinum in Nafion-117 membranes," *Electrochim. Acta*, vol. 117, pp. 107-112, Nov. 2014, doi: 10.1016/j.electacta.2014.05.018.

[5] M. M. Manaf, M. Ghaffar, and A. S. Varma, "Sorption of tetraammineplatinum(II) chloride on Nafion-117 membranes," *Electrochim. Acta*, vol. 117, pp. 107-112, Nov. 2014, doi: 10.1016/j.electacta.2014.05.018.



ORCID

# Advanced Manufacturing of Bilayer Solid Dosage Forms: Integration of 3D Printing onto Injection Molding Substrates

Student: Han Xu Supervisors: Dr. Ian Major and Dr. Evert Fuenmayor

### Introduction

Conventional drug production, such as wet and dry granulation, provides the advantages like maintaining stable dose and minimal variability among the batches. However, it cannot make personalized treatment that could target different individuals.

The 3D printing manufacturing technique enables the creation of customized medicines for individual patients through a 'layer by layer' approach. While effective for personalized medicines, mass production using 3D printing may encounter high-cost challenges.

Injection molding has been also applied in the pharmaceutical industry. It boasts fast production with continuous off-line work and requires less labor. However, when adjustments to the drug release are necessary, it seems limited to fine-tuning through parameter changes, and the use of customized molding tooling incurs additional costs.

Overprinting is an innovative approach that combines the above two techniques to tailor the personalized solid dosage forms. It started from hybridizing the injection molded substrates then followed by overprinting onto them. The overprinted tablets offer two drug release mechanisms that containing one drug. It has potential to improve the patient compliance, reduce the pill burden, achieve a rapid therapeutic effect with the 3D printed layer, and maintain a constant level with the injection molded layer.



Figure 1.1 Three different 3D printed overprinted tablets (a) 3D printed overprinted tablet, (b) injection molded tablet, (c) injection molded tablet.

### Objectives

- Design a fabrication method to overprint onto the injection molded tablet substrate.
- Conduct the extensive testing of the overprinted tablets including the interfacial bonding strength.
- Identify the factors influencing the drug release profile and manufacturing time of the overprinted solid dosage form.

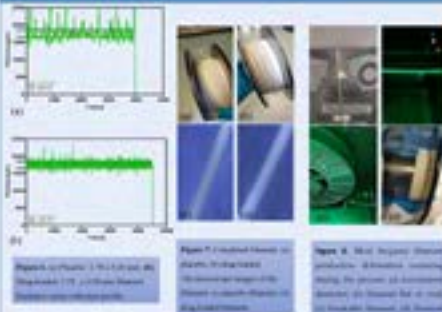
### Material and Methods



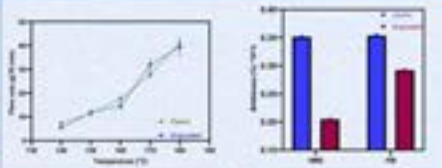
Figure 1.3 The production steps for injection molded tablets (a) Injection Molding, (b) 3D Printing, (c) Final Tablet Production.

### Results and Discussion

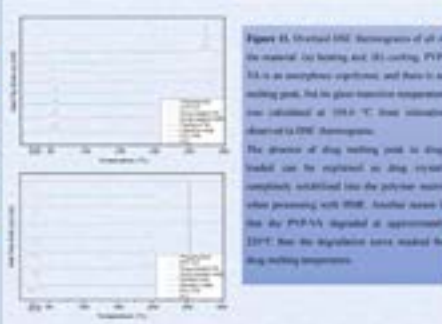
#### Filament Making



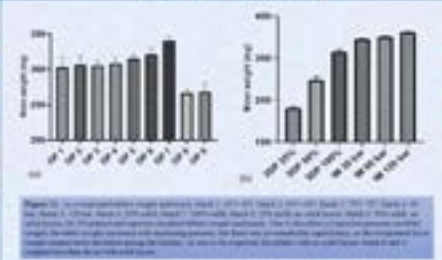
#### Melt Flow Indexing and Filament Brittleness



#### Differential Scanning Calorimetry



#### Tablets Weight Uniformity



### Tablets Dissolution Testing

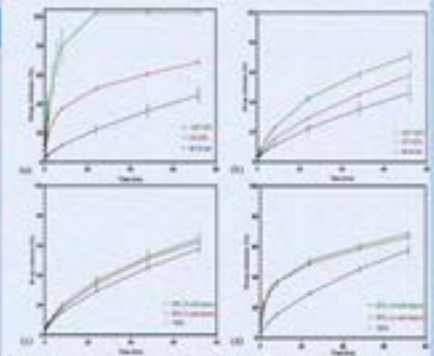
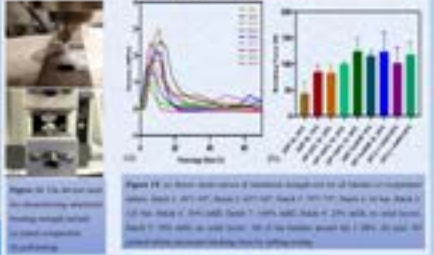
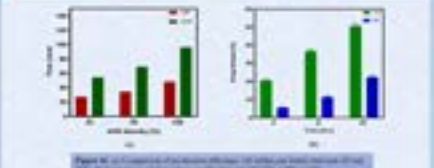


Figure 1.10 Drug release profiles of injection molded and 3D printed overprinted tablets.

### Tablets Interfacial Strength



### Mass-Customization of the Tablets



### Future Work

- Characterize the drug release profile and mechanism of IM and OP layer respectively in a bilayer tablet (drug layer with the placebo layer) containing one drug.
- Overall investigation of the critical factors that determine the interfacial bonding strength between the OP and IM layers.
- Comparison of the production rates and drug release mechanisms between overmolding and overprinting of solid dosage forms.

### References

1. J. M. G. P. (2019). 3D Printing of Pharmaceuticals. *Pharmaceutical Research*, 36(1), 1-10.
2. S. J. C. (2018). 3D Printing of Pharmaceuticals. *Pharmaceutical Research*, 35(1), 1-10.
3. M. J. (2017). 3D Printing of Pharmaceuticals. *Pharmaceutical Research*, 34(1), 1-10.
4. A. B. (2016). 3D Printing of Pharmaceuticals. *Pharmaceutical Research*, 33(1), 1-10.
5. K. L. (2015). 3D Printing of Pharmaceuticals. *Pharmaceutical Research*, 32(1), 1-10.
6. P. Q. (2014). 3D Printing of Pharmaceuticals. *Pharmaceutical Research*, 31(1), 1-10.
7. R. S. (2013). 3D Printing of Pharmaceuticals. *Pharmaceutical Research*, 30(1), 1-10.
8. T. U. (2012). 3D Printing of Pharmaceuticals. *Pharmaceutical Research*, 29(1), 1-10.
9. V. W. (2011). 3D Printing of Pharmaceuticals. *Pharmaceutical Research*, 28(1), 1-10.
10. X. Y. (2010). 3D Printing of Pharmaceuticals. *Pharmaceutical Research*, 27(1), 1-10.





## A pH sensitive Hydrogel for Colon Targeted Delivery

Iga Peterson, Dr Patricia Heavey, Professor Clement Higginbotham

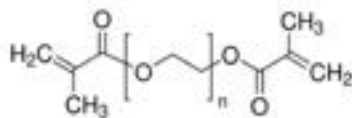
Technological University of the Shannon: Midlands Midwest, Athlone Campus, University Road, Athlone, Co. Westmeath, N37HD68, Ireland

### Abstract

This study explores a novel drug delivery hydrogel, incorporating Poly (ethylene glycol) dimethacrylate (PEGDMA) and Eudragit® S100 polymers for pH targeted biomedical applications. PEGDMA and Eudragit® S100 were chosen for their biocompatibility and responsiveness to pH. Initial studies in distilled water and PBS pH 7.4 to mimic the colon environment show all gel fraction results exceeding 90%, indicating high cross-linkage and structural integrity, enhancing the potential for targeted drug delivery, especially in the gastrointestinal tract. Furthermore, the swelling studies showed substantial swelling capabilities, with an average of 5% swelling after 4 hours, 16% swelling after 24 hours, which increased to an average of 20% swelling after 48 hours.

### Aim

This project focuses on creating an innovative drug delivery system using a hydrogel formulation with the polymer Poly (ethylene glycol) dimethacrylate (PEGDMA). The goal is to enhance pH sensitivity by incorporating another polymer, Eudragit® S100. This system is designed for pH targeted biomedical applications. The use of UV photopolymerization in the curing process offers a solvent-free method, promoting biocompatibility and ease of curing. The pH sensitivity of the hydrogel in swelling and gel fraction studies were tested in PBS pH 7.4 to mimic the environment of the colon.

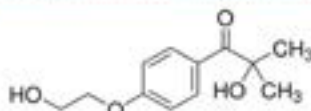


### PEGDMA

PEG is a synthetic polymer composed of repeating ethylene glycol units linked by ether bonds. DMA comprises of two methacrylate functional groups, situated at both ends of the PEG chain, facilitating polymer crosslinking<sup>1-3</sup>

#### Advantages:

- Established in literature
- Water-soluble at room temperature
- Stability in diverse conditions (high temperatures, acidity, alkalinity)
- Minimal toxic effect
- Adjustable to exhibit biocompatible properties

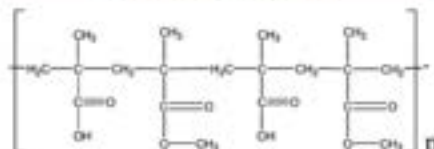


### IRGACURE 2959

This photo-initiator finds widespread use in the UV photopolymerization process of various polymers, especially in biomedical applications<sup>4,7</sup>

#### Advantages:

- Minimal cellular toxicity
- Minimal odour profile
- Low immunogenic response



### Eudragit® S100

Copolymer composed of methyl methacrylate and methacrylic acid<sup>8,9</sup>

#### Advantages:

- Responsiveness to pH range of 6-7 (colon targeting)
- Gastric acid resistance
- Biocompatible

### Hydrogel preparation

Control and H1-H4 hydrogel formulations were prepared through UV photopolymerization. The dry weight of each hydrogel was noted<sup>1,10,11</sup>

#### Experimental Setup:

Hydrogels were placed in separate labelled petri dishes with 30mL distilled water / PBS pH 7.4

### Gel fraction

The samples were covered and allowed to swell for 72 hours at room temperature. The soluble parts were removed and the samples were dried until no change in weight was observed<sup>1,12,13</sup>

#### Gel Fraction Calculation:

Gel fraction (%) =  $W_{ex}/W_0 \times 100/1$ .  
"W<sub>0</sub>" is the initial dry weight, and "W<sub>ex</sub>" is the dried weight after water extraction.

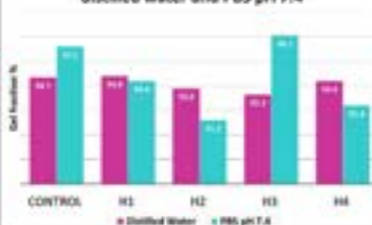
### Swelling studies

The samples were periodically removed, blotted dry, and weighed. The samples were then re-submerged in solution<sup>1,12,14</sup>

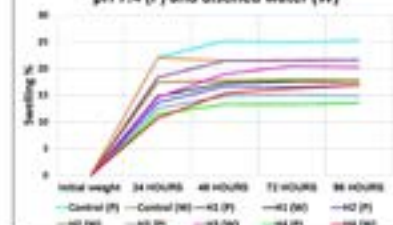
#### Swelling Percentage Calculation:

Swelling (%) =  $(W_t - W_0)/W_0 \times 100$ .  
"W<sub>t</sub>" is the hydrogel weight at pre-determined time intervals, and "W<sub>0</sub>" is the initial dry weight.

Gel fraction % for control and H1-H4 in distilled water and PBS pH 7.4



Swelling % for control and H1-H4 in PBS pH 7.4 (P) and distilled water (W)



### Discussion

This study on a novel drug delivery hydrogel incorporating PEGDMA and Eudragit® S100 shows promising results. High gel fraction (>90%) in distilled water and PBS (pH 7.4) indicates strong cross-linkage, crucial for effective drug delivery. Swelling studies reveal significant swelling capabilities, with an average 5% swelling after 4 hours, 16% swelling after 24 hours and 20% at 48 hours, demonstrating responsiveness to environmental conditions. Carefully chosen materials—PEGDMA, IRGACURE 2959, and Eudragit® S100—offer biocompatibility and pH sensitivity. UV photopolymerization ensures a solvent-free, biocompatible curing method.

### Future work

Further testing will explore the effect of pH 1.2, 4.6 and 6.5 on the hydrogels to mimic the various pH environments found within the gastrointestinal tract. Additionally, drug dissolution may be carried out to accurately mimic the digestive tract according to transit time and pH.

| Hydrogel code | PEGOMA 750 (wt%) | Eudragit S100 (wt%) | Ir-gacure 2959 (wt%) |
|---------------|------------------|---------------------|----------------------|
| Control       | 100              | 0                   | 0.1                  |
| H1            | 90               | 10                  | 0.1                  |
| H2            | 80               | 20                  | 0.1                  |
| H3            | 70               | 30                  | 0.1                  |
| H4            | 60               | 40                  | 0.1                  |



SPORT  
HEALTH  
EXERCISE





## A Novel Framework for Smart Cyber Defense: A Deep-Dive Into Deep Learning Attacks and Defenses

SIAM APPROVED, IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS: PART A, ACCEPTED FOR PUBLICATION, 2022  
L. Software Research Institute, Technological University of Shannon, Midlands Midwest, Ardara NE2 HDB Ireland  
J. Design Centre for Data Analytics, University of Galway, Galway, H91 NKA Ireland  
K. Faculty of Engineering, BQ University, BQ, Vietnam

This work was supported by the Technological University of Shannon, Midlands Midwest under the President Doctoral Scholarship.

### Problem



Cybersecurity has become increasingly important in recent years due to the rising number of cyber attacks and data breaches. It is critical to ensure data security and intelligent models in **Smart Manufacturing (SM)** to protect the digital industry from potential cyber threats. Machine Learning (ML) and Deep Learning (DL) algorithms are used in various applications to detect patterns and anomalies in SM systems' vast amounts of data.

However, these artificial algorithms are susceptible to various types of attacks such as backdoors, making the security of these artificial algorithms essential in SM to protect against general cyber threats and model attacks.

### Objective

- Understanding the formation of backdoor attack
- Understanding the attacker's threat model
- Proposed a cyber infrastructure framework to secure smart industries



### Understanding of backdoor attack

#### Properties

- Insider attacks and triggers can be injected during the training of the model.
- Model performance does not degrade on clean inputs.
- Difficult to detect as the triggers are stealthy.



Injection of backdoor attack during DL model training

In diagram, visible and invisible triggers have been shown.



Types of various backdoor attack images

#### Attack Examination tool

- Threat model is a process or framework used to systematically identify and address risks and vulnerabilities in a system.
- A tool to examine the adversary model.

#### Adversary model

- An adversary model refers to a framework that helps in creating a specimen of the attackers in the system.

#### Backdoor specimen

- The attacker can generate the specimen based on several assumptions, resources, tool, capabilities.



### Future work

- ✓ We intend to propose a defense solution to mitigate backdoor attacks in smart manufacturing.

### Proposed security framework



### Conclusion

The proposed framework addressed the vulnerabilities of DL systems by incorporating multiple layers of security.

Privacy and protection of data and models complement with threat model framework to analyze the vulnerabilities of the system.

### References

S. Amjad, S. H. Alshamir, Y. Qiao, B. Lee and Y. Ye, "A Novel Framework for Smart Cyber Defense: A Deep-Dive Into Deep Learning Attacks and Defenses," in *IEEE Access*, vol. 10, pp. 1032-1042, 2022, doi: 10.1109/ACCESS.2022.3201222.

### Acknowledgements

This work was supported by the Technological University of Shannon, Midlands Midwest under the President Doctoral Scholarship



SCAN ME





## HOW CAN WE DESIGN A VIRTUAL REALITY ENVIRONMENT FOR CANCER SURVIVORS THAT AIDS THEIR RECOVERY?

RESEARCHER: JOS GIJBELS

SUPERVISORS: DR MARIE A. WALSH & ADRIAN FIELDING

### Research Questions

How can a VR environment be used as a recovery tool for cancer survivors to aid in their recovery? This is the major question, followed by 3 sub questions

#### Sub Questions:

1. How did participants experience the VR environment?
2. What are the key design considerations that need to be accounted for when designing a VR environment for cancer survivors?
3. How did the VR environment impact the Proactive Mindset Growth Area?

### Introduction

#### Stages of this research MA to PhD

##### Stage one - Masters by Research

Analysing pre-existing data and research papers. Conducting the focus groups. Analyse this data using Reflexive Thematic Analysis. From this data create a design document that outlines what will be in a high quality scene within the VR environment and the design considerations.

##### Stage Two - PhD

Create the high-quality scene within the VR Environment from the design document. Conduct the one-to-one semi-structured interviews with the participants. Analyse this data. From this data create a new design document outlining changes to be made and the creation of the full VR environment

This research uses a multimethod qualitative approach. Interpretive phenomenology from a constructivist viewpoint using multi methods of data collection which are analysed using inductive Reflexive Thematic Analysis. The research sample are participants of a Cancer Care Centre in Tipperary Town called Circle of Friends. This research has the potential to contribute new knowledge to our understanding of survivor recovery and the way in which VR can be used as a therapeutic tool.

### Summary of Work to Date

The start date for the MA was September 2021. The projected end date for the PhD is February 2026.

#### Literature Review Chapter:

An extensive literature review has almost been completed which focuses on 4 key areas: Cancer & Cancer survivorship, Post Traumatic Growth, Mindfulness and Virtual Reality. This chapter is about 85% complete.

#### Methodology Chapter & Ethics:

This chapter is in the final stages of completion. This chapter is about 90% complete. I have been approved by the ethics committee at TUS.

#### Cancer Care Centre (Circle of Friends):

I am working with the Cancer Care Centre in Tipperary Town called Circle of Friends. This is where participants have been recruited from and where the focus groups and interviews will be conducted. Focus Group Data Collection took place in June 2022.

#### Data analysis:

The focus group data is being analysed using inductive RTA. I am in the process of refining & defining themes. A design document has been created from the data for a bespoke VR app for cancer survivors.

#### Virtual Reality (VR):

The development of the prototype VR app began in January 2024.

### VR in Health Care

Alemanno et al. (2019) found that the use of VR "significantly lowered subjective stress, depression, and anxiety" and helped patients with mood disorders in psychiatric wards. In another recent study, Niki et al. (2019) found that the use of VR led to significant improvements for "pain, tiredness, drowsiness, lack of appetite, shortness of breath, depression, anxiety, and well-being, as well as fun and happiness", for terminal cancer patients

VR offers a safe environment to carry on different interventions ranging from the rehabilitation of discharged patients directly at home, to the support of hospitalized patients during different procedures and also of oncological inpatient subjects (Chirico et al., 2016). Their study also found for cancer patients that "VR improved patients' emotional well-being, and diminished cancer-related psychological symptoms". This is very similar to the findings of the study by Baños et al. (2013).

VR as a treatment does not seem to diminish over time or with the repeated use of VR, pain reduction and the patients' quality of life increased with the use of VR. (Austin et al., 2019; Alemanno et al., 2019).

One of the main positive aspects of VR as a treatment is that it is a non-opioid treatment which has no serious side effects (Jones, Moore and Choo, 2016).

### VR and Cancer Survivorship

Only recently has VR been thought of as a therapeutic tool to aid recovery in cancer survivorship. VR-based interventions have statistically significant effects on reducing symptoms of anxiety, depression, pain, and cognitive function (Zeng et al., 2019).

Most recent studies focus on acute pain management or palliative care (Niki et al., 2019; Zeng et al., 2019), this project will help to fill the knowledge gap and concentrate on positive growth drivers for cancer survivors as a whole.



### Mindfulness for Cancer Survivors

Mindfulness-based interventions (MBIs) are particularly useful when dealing with common experiences of cancer (psychically and psychologically) (Carlson, 2016).

Carlson (2016) uses an online adaptation of their Mindfulness-based Cancer Recovery (MBCR) and suggests that this could be the future of mindfulness training for cancer survivors.

Mindfulness in general promotes psychological flourishing and overall positivity in the face of cancer (Garland et al., 2017).



### VR & Mindfulness for Cancer Survivors

The aim of this project is to combine VR with Mindfulness to be a positive growth driver for cancer survivors to aid in their recovery.

### Thanks!

Thanks for taking the time to read my poster. If you have any questions please do not hesitate to make contact.

### Contact Information

Name: Jos Gijbels

Email: jos.gijbels@tus.ie

Phone: 083 149 3913





## Bioactive compounds from cyanobacteria and microalgae for human health applications - 'An Irish marine pharmacy'

**Katie Shiels**, Patrick Murray and Sushanta Kumar Saha

CHIMERA research group, Shannon Applied Biotechnology Centre, Department of Applied Science, TUS

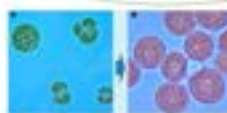
**Amino acids:** Cyanobacteria and microalgae are known to be rich sources of essential amino acids, including those crucial for the synthesis of neurotransmitters in the brain e.g. GABA. Consumption of these amino acids may contribute to the maintenance of a healthy gut microbiota, fostering the growth of beneficial bacteria that play a pivotal role in **digestive well-being**. Incorporating cyanobacteria/microalgae-derived amino acids into one's diet could represent a novel approach to promoting both **cognitive well-being** and potentially gut health.



**Lipids:** These lipid-rich sources are particularly abundant in omega-3 fatty acid, essential for various physiological functions. Incorporating these lipids into the human diet can contribute to **cardiovascular health** by promoting a favourable lipid profile and reducing the risk on chronic diseases. Moreover, the presence of unique lipids, such as poly unsaturated fatty acids and bioactive compounds, may have **anti-inflammatory** properties, potentially mitigating inflammation-related conditions.



**Source of protein:** These microorganisms are rich in **high-quality proteins** that contain essential amino acids vital for human health. Spirulina, a type of cyanobacteria, is particularly notable for its protein content, constituting up to 70% of its dry weight.



**Natural Pigments:** Natural pigments from cyanobacteria and microalgae include chlorophylls, carotenoids and phyco-bili-pigments, they not only contribute to the vibrant colour observed in these microorganisms but also offer valuable properties for industrial, nutritional, and medical purposes. These pigments can exhibit **antioxidant** properties, and **provitamin A** activities. These natural pigments can be used in food and cosmetic industries, as well as for their potential as **natural colourants** and antioxidants in various products

**For more information:**

Contact [katie.shiels@tus.ie](mailto:katie.shiels@tus.ie)

OrcID: <https://orcid.org/0000-0003-1603-8882>



**Shannon ABC**  
applied biotechnology centre









## Implementation of a Quality Risk Management Approach to Commissioning and Qualification in the Biopharmaceutical Industry using the ISPE Guidelines.

**Student:** Norma Nagle

**Research Questions:**

1. 25 years from the first ISPE standard is the Quality Risk Management baseline guide vol 5 2nd edition the final solution for qualification?
2. Does a gap exist in CQV implementation of ISPE standards?
3. When qualifying systems do Engineers know if they are Implementing a Quality Risk Management Approach to Commissioning and Qualification in the Biopharmaceutical Industry?

**Introduction:**

The literature review will examine the implementation of a Quality Risk Management Approach to Commissioning and Qualification in the Biopharmaceutical Industry using the ISPE Guidelines. The biopharmaceutical industry plays a crucial role in the global landscape of healthcare, producing life-saving drugs and therapeutic agents that address many diseases. Within this sector the efficient qualification and management of all systems are essential elements in ensuring the safety and integrity of pharmaceutical products.



**Aim:**

The aim is to get an understanding of the current role and effectiveness of the ISPE Guidelines.

**Objective:**

The objective is to establish the effectiveness of the ISPE Guidelines in relation to C & Q activities.

**Methodology:**

Through a blend of theoretical analysis, interviews and practical insights, the dissertation will seek to contribute valuable knowledge to the best practices in the biopharmaceutical industry.

**Potential Findings:**

That there is still a gap between the standards and what actually happens out in the field.



# Parents' experiences accessing mental health services for their adolescents with mental health difficulties: a scoping review

Seána Nic Dhonnacha<sup>1</sup>, Des Cawley<sup>1</sup>, Lisa Kerr<sup>1</sup>, Yvonne McCague<sup>2</sup>

## Background

This scoping review explores parents' experiences of accessing mental health services for their adolescents with mental health difficulties. Health systems globally have inadequately addressed the burden of mental health disorders. A notable gap exists between population needs and the provision of mental health services (MHC, 2022). Strains exist in access to mental health services for adolescents. Increasingly access to mental health services is sought through Emergency Departments (ED) (MHC, 2022).



Key Policy Documents

## Methodology

A scoping review was completed based on the methodology of Arksey and O'Malley's (2005) six stage framework. PRISMA-SuR checklist was adhered to. A database search of CINAHL, EBSCO, Scopus, MEDLINE and SocINDEX databases was performed using the inclusion criteria below.



Research literature was screened between 2015-2023, and 24 studies were included in the scoping review. Studies originated from Canada (n=6), UK (n=4), Ireland (n=5), Australia (n=3), Norway (n=1), Spain (n=1), US (n=1) and included study methodologies from qualitative (n=12), quantitative (n=10), mixed methods (n=1) and reports (n=1).



## Acknowledgements:

This research is funded by the Presidential Doctoral Seed-Fund of the Technological University of the Shannon Midlands Midwest.

## Affiliations:

Department of Nursing and Healthcare, Technological University of the Shannon Midlands Midwest<sup>1</sup>  
Health Service Executive, Regional Hospital Mullingar<sup>2</sup>

## References:

Arksey, H. & O'Malley, L. (2005) Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology*, 8(1), 19-30. Coyne, I., McNamara, N., Gower, C., McNicholas, F. (2015) Adolescents' and parents' views of Child and Adolescent Mental Health Services (CAMHS) in Ireland. *Journal of Psychiatric and Mental Health Nursing*. McNicholas, F. (2016) Child & adolescent Emergency Mental Health Crisis: "A Neglected Corner". *Letter*. Mental Health Commission (2022) Independent Review of the provision of Child and Adolescent Mental Health Services (CAMHS) in the State by the Inspector of Mental Health Services. MHC, Reaveaux, A.F and Zdanowicz, N. (2019) Creation of an out of hours child and Adolescent Mental Health emergency service. *International Journal of Psychiatric and Mental Health*, 1, 13-19. World Health Organisation (2021) Comprehensive mental health action plan 2013-2030. Geneva: World Health Organisation, 2021. Zilan, C., Mortrud, W., Neauquis, M.E, Picard, S., Gendron-Claude, L., Cariveau, F. (2021) An exploration of youth and parents' experiences of child mental health service access. *Archives of Psychiatric Nursing* 35, 549-555.

## Findings

Data analysed identified three key themes as illustrated below. 1. Adolescent community mental health services for parents of adolescents with mental health difficulties. 2. Emergency department pathway to access mental health care for adolescents with mental health difficulties, and 3. Experiences of parents of adolescents with mental health difficulties accessing mental healthcare services.



## Discussion

McNicholas (2016) identifies that scheduled mental healthcare services for adolescents in Ireland currently operate Monday to Friday from 9am to 5pm, with limited variation of scheduled community services available outside these times. The Mental Health Commission (MHC) (2022) found that despite the research demonstrating population demand and service need, scheduled community mental health services are not provided over weekend periods in all Community Healthcare Organisations (CHOs).

The MHC recommends young people and parents must be involved at every level of CAMHS service planning (MHC 2022, p. 15). This highlights the importance of effective communication with adolescents and their parents (Coyne et al. 2015).

Adolescents are attending EDs for mental health difficulties (Zilan et al. 2021; Reaveaux & Zdanowicz, 2019), and as the ED attempts to create that place of safety many children and adolescents are admitted to a paediatric inpatient bed to be monitored in the absence of an alternative option (MHC, 2022).

## Conclusion

The Scoping Review found that the needs of adolescents and their parents who access mental health services requires further research. The number of adolescents with mental health difficulties is increasing exponentially nationally and internationally.

The scoping review demonstrates that support from practitioners in healthcare organisations is critical for effective care to support the parents of adolescents with mental health difficulties.

A dearth of research on parents' experiences of accessing mental health services for their adolescent with mental health difficulties through the ED is evident. Further research in a systematic review would add to the body of knowledge for the wider global community.

## Relevance to clinical practice

Understanding parents' experiences when accessing mental health services with their adolescents can inform practice, policy making and further research.



## Collaborative knowledge creation between industry and University of Applied Sciences in Design-based education: Design-based research

Ulla-Maija Knuutti, Business and hospitality, TUS

### INTRODUCTION

To equip graduates with 21st century skills, many higher education institutions have adopted student-centred teaching methods such as problem-based learning, project-based learning and design-based learning. These methods involve students solving real-life challenges in collaboration with businesses. There is a lot of research on the student skills and teacher work associated with these methods, but little on the business aspects. What is in it for them? What would make them more engaged? Could they gain the same skills as the students? **How could collaborative knowledge creation between industry and university of applied sciences be improved in design-based education?**

### AIMS AND OBJECTIVES

- What are the alternatives for implementing design-based education to enable **effective collaborative knowledge creation** between the UAS and the participating organisation/industry representative for the benefit of the participating company and the UAS?
- How can these alternatives be established and sustained in the design-based education model at the UAS and in the participating company?

### METHODOLOGY

Design-based research (DBR) is an educational research method that aims to develop and improve educational practice through a **cyclical and reflective process by bridging theoretical research and educational practice**. (Barab & Squire, 2004, Reeves, 2006) **In this research teachers, students and business representatives work together with researchers to identify the problem, create a prototype solution based on existing design principles, and test the prototype until all stakeholders are satisfied with the results. Qualitative data is collected throughout the cycles and analysed using thematic analysis.**

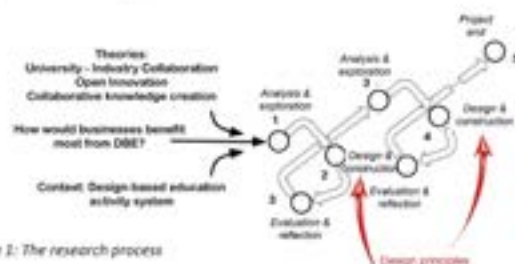


Fig 1: The research process

### SCIENTIFIC OUTPUTS: Design principles

In design-based research there are two types of outputs: scientific outputs (design principles) and practical outputs (design artefact(s)). These initial design principles are developed based on a literature review. **The design principles guide the design cycles and evolve throughout the research.**

|                                   |   |
|-----------------------------------|---|
| Identification of the partnership | Ankrah & Al/Isabbao, 2015; Ashruf et al., 2021; Plewa et al., 2013; Thune, 2011 |
| Communication and feedback        | Ashruf et al., 2021; Pan et al., 2021; Plewa et al., 2013; Thune, 2011          |
| Commitment                        | Ankrah & Al/Isabbao, 2015; Plewa et al., 2013; Thune, 2011                      |
| Knowledge creation and exchange   | DuChantler et al., 2009; Pan et al., 2021; Peschl & Fundneider, 2014            |

### PRACTICAL OUTPUTS: Design artifact(s)

Practical artefacts can be anything that could contribute to collaborative knowledge creation. Some possible artefacts are

- Apps or **training** to facilitate negotiation and collaboration between teachers and companies
  - Training or **guide** for companies on the benefits of university-industry cooperation
  - Training or **app** to improve communication between students and company representatives
- The planning of artefacts starts after the problems have been identified together with all stakeholders.

### DISCUSSION:

- Design-based research is still a relatively **new research method** and it is imperative to focus not only on the artefacts and solutions, but also on the design principles as a scientific output.
- Although the business aspect is very important in this research, it is important to remember that the cooperation between companies and universities of applied sciences must always **meet the learning objectives** of the study modules.

### Bibliography:

Ankrah, S., & Al/Isabbao, O. (2015). University-industry collaboration & systematic review. *International Journal of Management, 32*(2), 367-408. <https://doi.org/10.1016/j.ijom.2015.01.004>

Ashruf S., van der Pijl, D., Aerts, H., Wijnhoud, R., & Peng, R. (2021). Professional Practice: A Case Study of Collaborations between Education and Industry (DBR Scholar Paper 2021715). [https://papers.ssrn.com/sol3/cdx.cfm?abstract\\_id=3904720](https://papers.ssrn.com/sol3/cdx.cfm?abstract_id=3904720)

Barab, S., & Squire, K. (2004). Design-based Research: Putting a Stake in the Ground. *Journal of Learning Sciences, 13*(1), 3-14. [https://doi.org/10.1207/s15327965jls1301\\_1](https://doi.org/10.1207/s15327965jls1301_1)

DuChantler, E., Venotagen, J. A. & M., Siemens, H. J. A., Müller, M., & Gries, O. (2009). The Challenges of Collaborative Knowledge Creation in Open Innovation Teams. *Human Resource Development Review, 8*(3), 350-361. <https://doi.org/10.1177/1540085209338243>

Peschl, G., Teiwis, P. A., Shaltesmanov, V., & Juhn, E. (2021). Essence of authentic management in project based learning: Insights from a university's global project programme. *Journal of International Education in Business, 14*(2), 291-328. <https://doi.org/10.1108/089-04-2020-0019>

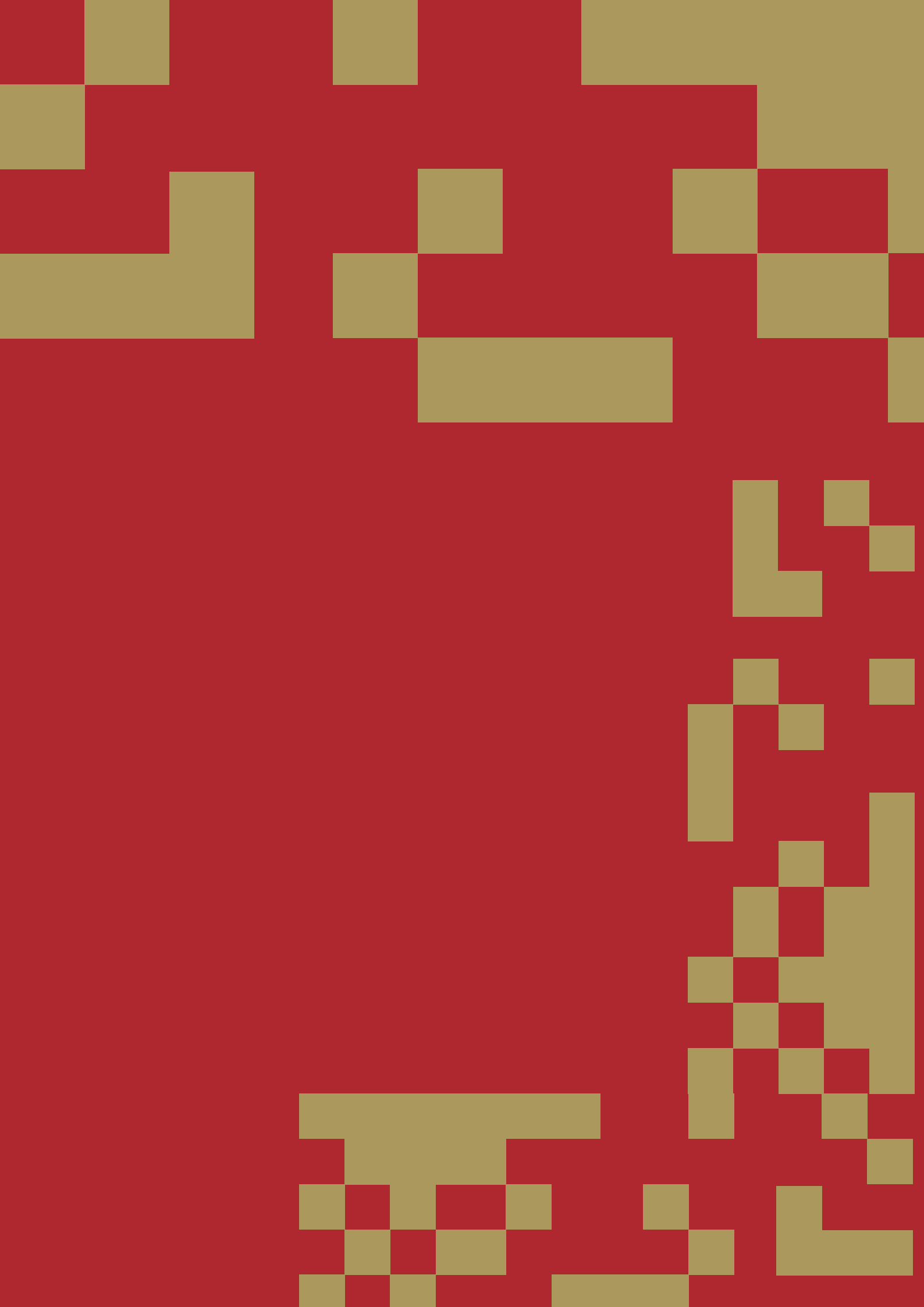
Peschl, M. F., & Fundneider, T. (2014). Designing and Enabling Spaces for Collaborative Knowledge Creation and Innovation: From Managing to Enabling Innovation in socio-epistemological technology Campuses. In *Human Behavior, 51*, 989-999. <https://doi.org/10.1016/j.hbs.2012.05.027>

Reeves, T. (2006). Design research from a technology perspective. In *Educational design research* (pp. 64-76). Routledge.





# **Social Innovation & Digitalisation**





## Unconscious Care?

How does unconscious bias impact the delivery of social care in Ireland?

*A mixed methods approach*



**TUS**  
Social  
Sciences  
ConneXions



PhD Candidate: Amy Bradley  
Principal Supervisor: Dr. Matthew Cannon  
Co Supervisor: Dr. Frank Houghton

### 01 Introduction

Unconscious bias [UB], unlike conscious biases, is a universal byproduct of human cognition, that are activated automatically and operated outside of consciousness [1,2]. UB's have significant influence over our thoughts, beliefs, judgements and behaviours. While we may not always have conscious intent to cause harm to others, our UB's can have unintended impacts. Often these behaviours and their consequential impacts contradict with our conscious values [3,4].

Vast bodies of research confirm that we all have unconscious biases, and that they are quite impossible to avoid, thus, it is safe to postulate that social care workers are not an exception to the rule. Meaning that unconscious bias could be having negative implications on social care standards, service delivery and workplace relationships. This research is ultimately concerned with how unconscious bias impacts the delivery of social care in Ireland.

|                                  |   |
|----------------------------------|---|
| <b>S</b> Sample                  | Social Care Workers from various social care settings in Ireland  |
| <b>P1</b> Phenomenon of interest | Unconscious Bias and how it impacts the delivery of social care in Ireland from a social care workers perspective   |
| <b>D</b> Design                  | Mixed Methods Approach<br>Areas to explore (Study 1 & 2):<br>Awareness/Recognition/Experiences/Implications and how to manage<br>A Systematic Evaluation on UBT |
| <b>E</b> Evaluation              | Statistical Analysis<br>Reflexive Thematic Analysis<br>Evaluation (Typology)  |
| <b>R</b> Research type           | Mixed Methods   |

### 02 Aims & Objectives

**Aim 1:** Identify awareness, prevalence and impact of unconscious bias on the field of social care.

#### Objectives:

- Establish social care workers level of awareness of the concept of Unconscious Bias as well as recognition of UB in the field of social care.
- Obtain social care workers perspective on how unconscious bias manifests in social care settings and its impact on staff, service users and organisation.
- Cross examine the impact of unconscious bias found in the data with the CORU standards of proficiency to identify 'standard impact areas' that could be undermined due to unconscious bias.

**Aim 2:** To produce evidence-based recommendations for future novel unconscious bias training programme.

#### Objectives:

- Examine the views and perspectives of social care workers on how unconscious bias could be best addressed in social care settings.
- Conduct a systematic evaluation of studies that previously designed, implemented and evaluated unconscious bias training to create a typology
- Triangulate the research findings (Study 1, 2 & 3) to produce evidence-based recommendations for novel unconscious bias training programme.

### 03 Methodology

This research required a mixed method approach which includes survey, interviews and desk-based research

#### Study 1: Social Care Worker Survey [SCWS]

The researcher conducted quantitative research for Study 1 in the form of an online anonymous survey. This anonymous survey was circulated to social care workers across Ireland.

#### Study 2: Male Social Care Interviews [MSCWI]

Gender imbalance identified in Study 1. 84% of Research Participants were women 16% were men. Male SCW recruited to take part in semi-structured interviews to mitigate gender imbalance.

#### Study 3: UBT Evaluation (Typology) and Recommendations

- Desk based review of studies that developed, implemented and evaluated novel unconscious bias training with various providers in the care related areas.
- Triangulate evaluation findings with primary research findings to produce evidence-based recommendations for future Novel UBT

### 04 Progress

#### Study 1 Social Care Worker Survey

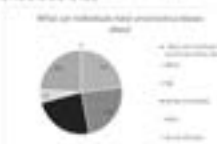
- Ethically Approved.
- Piloting Completed
- Survey Edited Using the feedback gained from Pilot
- Codebook Designed
- Disseminated to 200+ SC Organisations, Social Care Ireland Platforms, Social Media etc...
- n195 Research Participants
- Analysis Ongoing- SPSS

#### Preliminary Findings Overview

- 84% (n163) of Research Participants were women- 16% were men (n33)
  - Affirming Men are a minority in the social care sector (gender imbalance- study 2)
- Mean Years of Service 10.35
- Familiarity with the term 'unconscious bias' average 3.91. 73% (n=142) of participants scored between 4-5 on the Likert scale indicating high familiarity

#### ➢ Experience/Witness unconscious bias

- Affinity Bias n92
- Halo Effect n108
- Perception Bias n152
- Confirmation Bias n114
- Horns Effect n101
- Availability Bias n86
- None of the Above n16



#### ➢ Preferred method of participating in unconscious bias training

- In house: n 59
- Online Training: n34
- Online Programme: n30
- App: n14
- Off Site: n53
- Other: n3



### 04 Progress Continued...

#### Study 2: Male Social Care Worker Interviews

- Sample interview questions, information letter, consent form and support contacts- Ethically Approved
- Feedback received on Interview questions from male social care workers as a form of piloting
- 6 Interviews Completed & Transcribed (4 more to be conducted)
- Preliminary Thematic Analysis Underway- Nvivo
- Emerging themes are as follows:



#### Study 3: Review of UBT Studies & Recommendations

Review of studies that developed, implemented and evaluated novel unconscious bias training with various providers in the care related areas has commenced

### 05 Conclusion

This poster presentation produced for the Research Week Impact event has provided the reader with an overview of the topic of unconscious bias in the social care field. The aim of this research is to understand social care workers level of awareness and experiences of UB in the field and to develop evidence-based recommendations for novel unconscious bias training, produced through the triangulation of study findings.

If you have any questions regarding this research, you can contact me via amy.bradley@tus.ie

#### References

[1] Banaji, M. R., Shook, N. and Brownstein, M. (2015) 'When bias is implicit, how might we think about repairing harm?', *Current Opinion in Psychology*, 4, pp. 185-188. doi: 10.1016/j.copsyc.2015.08.017.

[2] Alenxandru, D., Cornish, I. and Fresh, E. (2018) *Unconscious Bias Training: An assessment of the evidence for effectiveness, Equality and Human Rights Commission Research Report Series*. Manchester

[3] Wilson, T. D., Lindsey, S. and Schooler, T. Y. (2000) 'A Model of Dual Attention', *Psychological Review*, 107(2), pp. 300-326. doi: 10.1037/0033-2909.107.3.300.

[4] Soenen, P. (2012) 'Unconscious Bias: Definition and Significance', *Poljoprivredni glasnik Zagrebak*, 14(3), pp. 404-426. doi:10.15663/ogz.2012.140307.





## From Kitchen to Cubicle – A retrospective on the rights of women in employment with analysis of the Irish Corporate Governance (Gender Balance) Bill 2021

Student: Aoife Walsh - K00241005

Supervisors: Dr. PJ Ryan and Ann Marie Dooley

### Research Question

According to the 2021 World Economic Forum, Ireland has ranked in 9th place in the world in terms of gender equality. Irish women as of today have for the most part enjoyed the same legal rights as men and now have the freedom to choose where they can be, be it in the home or in the workplace, as opposed to how Irish women used to be relegated solely to the role of wife and mother.

What examples of Irish legislation and case law do we have that demonstrate different treatment for men and women in Irish society? Who were the feminist figures who brought change to Irish laws in the 70s, 80s and 90s? What examples do we have of EU law influencing Irish legislation and case law to work to promote gender equality in society? What is the scope of the Irish Governance Gender Balance Bill 2021? Is there to be done by the legislature to promote gender equality in Irish society?

My research's objective is to answer all the above questions.

### Introduction

Owing to Catholicism and economic factors, the choice of women was limited. Married women were primarily prohibited from working until the 1970s, when women started to actively protest for greater rights. The marital bar was removed in 1973 after Ireland entered the European Economic Community (EEC), allowing married women to work if they so desired. The EEC greatly influenced Ireland's legislative efforts to provide women greater choices and rights, particularly those in the workforce. Ireland has recently introduced an ambitious bill, the Irish Corporate Governance (Gender Balance) Bill 2021, which makes provisions for the regulation of gender balance on the boards and governing authorities of corporate bodies and related matters. By doing this, it will make it possible to implement female quotas in boardrooms. Within a year of the law's enactment, all corporations must have a minimum of 33% of each gender on their boards.

### Research's Objective

The purpose of my research is:

- To explore the treatment of women in past laws of Ireland.
- To analyse the scope and the effects of the proposed Irish Corporate Governance Gender Balance Bill 2021.
- To recommend possible reforms of the law that would help strengthen gender equality within Ireland.

### Summary of Work to Date

- I have completed 13 modules from Epigeum's online research integrity course organised by the GRO and received certificates
- I have taken several of the TUS GRO's online workshops, including the research induction, progress to doctoral register process and information on the master's viva.
- I have done extensive reading and research on the area of constitutional law that deals with discrimination on grounds of gender.
- As of now, I am making good progress with my first chapter.

### Timeline for Future Work

| Start to Finish         | Tasks to complete   |
|-------------------------|---|
| Present – Late Feb 2024 | Work on Chapter 3. I am currently looking at how legislation evolved after the 90s, particularly for working women, and case law.                               |
| March 2024              | Work on Chapter 2: I will look at Irish feminist figures, case law and amendments to Irish legislation which offered women additional protections and rights.   |
| April – June 2024       | Work on Chapter 1: Research on the law's treatment of women post-Independence to late 1960s, looking problematic laws and Article 41.2                          |
| July – Sept 2024        | Work on Chapter 4: Looking at laws finessing women's rights in the workplace, looking particularly at the Irish Corporate Governance (Gender Balance) Bill 2021 |
| Oct 2024– Dec 2024      | Work on Chapter 5: What else can we do? What other countries can we learn from?   |
| Jan – Feb 2025          | Do second draft of thesis   |
| March – May 2025        | Finalisation of final draft and Notification of Intention to Present for Examination  |

### Methodology

Types that will be adopted during my research



#### Feminist Black Letter Approach

This approach that will be utilized is a combination of feminist legal research and case law and legislation analysis.



#### AB Comparative

In order to examine how views towards women have changed over the course of social and legal history, a comparative historical viewpoint will be used.

### Publication/Dissemination

As the initial research process is still in its early stages, publication and dissemination of my findings have not yet taken place. However, the following papers have been considered:

- Law Society Gazette Ireland
- Australia Feminist Law Journal
- Springer's Feminist Legal Studies

#### Affiliations

Technological University of Shannon Midlands Midwest, Moylish Campus, Old Craioe Road, Limerick

#### Socials

Facebook: RDLatTUS Instagram: tus\_lir  
LinkedIn: @TUS Research, Development and Innovation

#### #tusresearchweek





## An investigation into the correlation between European Central Bank interest rate levels and primary residence mortgage arrears figures in Ireland Q3 2022 – Q3 2023.

Student: Brendan Forkan  
 Supervisor: Barraí Hennebry

### Research Aim:

This research aims to analyse European Central Bank and Central Bank of Ireland data on interest rates and mortgage arrears using quantitative techniques to determine if a correlation exists between ECB interest rates and primary dwelling mortgage arrears figures in Ireland, during the period Q3 2022 – Q3 2023.

### Introduction

During a period of unprecedented inflationary pressures in the Eurozone in 2022 - 2023, the European Central Bank (ECB) has engaged in a programme of extraordinary interest rate increases in an effort to dampen inflation from a high of 10.6% in October 2022 and restore it to the mandated 2% level. This research will subject ECB interest rate data and Central Bank of Ireland (CBI) mortgage arrears data, as well as unemployment rates and inflation data, to the statistical techniques of bivariate and multivariate analysis to ascertain if there is a positive or negative correlation between the rise in ECB interest rates and the level of mortgage arrears numbers in Ireland over the period under review Q3 2022 – Q3 2023.

### Background

The ECB has been raising interest rates at an alarming pace like many of its counterparts globally, in response to the recent surge in inflation - in the summer of 2022, the refinancing rate was 0.00%, while at time of writing in January 2024 the refinancing rate is 4.5%. Comparatively, the US Federal Reserve Bank has increased interest rates over the same period from 1.50% to 5.33%, and for the same reason - rampant inflation rates. The pace of interest rate increases is unprecedented in ECB history, yet the inflation rate remains stubbornly elevated at 5.2% in September 2023 in the Eurozone, down from a high of 10.6% in October 2022. All the while Irish mortgage holders suffer continued repayment increases, and with each rate rise and continued cost-of-living increases, this cohort of people become more vulnerable to mortgage delinquency.



### Methods:

There are two elements to this experimental, quantitative research, the first being the extraction of data to create descriptive statistics on the key economic data to assess for any trends, and secondly the application of statistical analysis techniques i.e. Bivariate Analysis (Pearson Correlation Coefficient) and Multivariate Analysis (Ordinary Least Squares Model) to control for other variables and test the research hypothesis to quantify or deduce any correlation which exists between mortgage arrears figures and ECB interest rate levels in Ireland.

| Research Design       |   |
|-----------------------|---|
| Research Philosophy   | Positivist/Pragmatism   |
| Research Approach     | Deductive   |
| Research Strategy     | Experimental  |
| Methodological Choice | Quantitative  |
| Sampling Techniques   | Purposive Sampling  |
| Data Collection       | Aggregate Data from major institutions ECB, Eurostat, CBI & CSO                   |
| Data Analysis         | Descriptive Statistics Bi-Variate Analysis (Pearson) Multi-Variate Analysis (OLS) |
| Theoretical Lens      | Economic Theory   |

### Expected Outcome:

It is expected that the data will reflect a positive correlation between ECB interest rates and mortgage arrears in Ireland, however this expectation is tempered due to fixed rate mortgages and short-term mortgage forbearance arrangements with Bank and non-Bank lenders in the market, which are likely to exert downward pressure or a dampening of the real correlation between the mortgage arrears figures and ECB rates.

### References:

Central Bank of Ireland. (2023). Residential Mortgage Arrears & Repossession Statistics Q3 2023. Dublin: Central Bank of Ireland.

Eurostat. (2023, December 20). Eurostat Key ECB Interest Rates. Retrieved from Eurostat: [https://www.ecb.europa.eu/stats/policy\\_and\\_exchange\\_rates/key\\_ecb\\_interest\\_rates/html/index.en.html](https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html)

MacroTrends. (2023, December 20). Macrotrends Ireland Inflation Rate 1960-2023. Retrieved from MacroTrends: <https://www.macrotrends.net/countries/IRL/ireland/inflation-rate-cpi>







## Stop Motion Animation workshops as a Creative Expressive Tool for Depression

Researcher: Kevin Dwane Supervisors: Dr. Marie Walsh, Michael Kiely  
Department of Design

### Introduction

Depression is a significant public health issue. It is a complex condition with many causes ranging from trauma to childhood. Equally there are many treatment options including; medication, therapy and peer support. Individual treatment needs vary as much the individuals seeking help. The need for treatment options was one of the primary driving factors underpinning this research.

### Research Objectives

The goal was to investigate the lived experience of people with depression and determine if there were any therapeutic benefits that could be gained from taking part in stop motion animation workshops.

### Methodology

The research is qualitative employing mixed methods. The initial stages involved semi-structured interviews to establish a baseline of the lived experience of depression. data gained was analysed using thematic analysis which generated 7 themes. These themes were used to drive and develop stop motion animation workshops. To date 3 workshops have been conducted; 1 pilot workshop and 2 participant driven workshops.

### Results

Two primary sources of data were generated from the workshops; stop motion animated short films and focus group feedback. Beneficial aspects included; social engagement, sense of accomplishment, instant playback of animation

*"something like this, there's not as much pressure on the individual and there talking to other people with similar experiences. And really it's just kind of making things and having fun, which I think would be hem, just really be therapeutic" from focus group*

### Acknowledgments

Special thanks to the involvement Centre Clonmel and Culain Training

### Stop Motion Animation Workshops

Prior to the rollout of the full workshops, a 2 hour pilot workshop was held with 4 volunteers. The purpose of the pilot workshop was to flag any outstanding issues and gauge timing before the participant workshops. Subsequently, two participant driven workshops were rolled out. Each workshop was 4 hours in length split into a 2 hour morning workshop, and a 2 hour afternoon workshop with a 1 hour break inbetween. Participants were requested to use quotes from the interviews as the basis of their animations. Morning workshops focused on brainstorming, story development and asset/background creation. Afternoon workshops focused primarily on animation. Each group had a workstation, materials, a computer tablet (with stop motion software) and lighting. Afternoon workshops were followed by focus groups designed to generate feedback on the workshops experience. The images below are taking from the stop motion films produced during the workshops



Contact: [Kevin.Dwane@tus.ie](mailto:Kevin.Dwane@tus.ie)





## How Trees Ease Grief 森林浴

How does a weekly Forest Therapy session impact a group of adults bereaved of a parent?

### Abstract

Research shows us that a profound loss can cause significant decrements to health, with higher incidences of ill-health, increased feelings of overwhelm, rumination (O'Connor et al. 2019), insomnia (Buckley et al. 2012), raised blood pressure (Buckley et al. 2010), decreased immune function (Muscariello 2022) depressive symptoms (Bonanno, 2004) and morbidity than in the non-bereaved population.

Forest Therapy has gained huge popularity, particularly in Japan where it (Shinrin Yoku) originated, because of its scientifically proven health benefits. Japanese studies demonstrate how an amelioration of health in communities.

With a mixed-method approach, this study aimed to assess the physiological, psychological, emotional and social impacts of participating in weekly Forest Therapy sessions for adults bereaved of a parent. This pilot contributes to a multi-disciplinary conversation about how Forest Therapy could impact the experience of grieving, adding to existing knowledge of how nature-based interventions could be utilised instead of medication for bereavement-related symptoms, and developing a whole new body of knowledge that hasn't yet been represented in the literature.

### Objectives

To pilot a multi-disciplinary approach bereavement support.

An interdisciplinary approach to produce new pioneering research data that spans conversations in several distinct disciplines.

To find new ways of supporting bereaved people, extending beyond the limits of talk therapy addressing the neurobiology of loss and using the evidence-based benefits of forest therapy with a bereaved population.

### A Mixed-Method approach

#### Before & After 6-week Intervention

- Generalized Anxiety Disorder Assessment (GAD - 7)
- Perceived Stress Scale
- The Warwick-Edinburgh Mental Well-being Scale (WEMWBS)
- Adult Attitude to Grief Scale (AAG)

#### After 6-week Intervention

- Semi-Structured Interview

### Work Summary

Research participants were recruited during June and July 2023 on a variety of social media platforms. All participants had been bereaved of a parent within 18 months of the study commencing.

In mid-August, a group of ten participants commenced a 6-week Forest Therapy programme, held on a Tuesday afternoon in the Phoenix Park Dublin, facilitated by a trained Forest Therapy Practitioner and attended by the researcher.

Before commencing, each participant was asked to complete four different scales, relating to different aspects of physical, emotional and mental health. These scales were repeated after the six-week intervention and each participant also participated in a semi-structured interview.

In October and November 2023, the researcher engaged in data familiarisation by listening to interview recordings whilst walking in the forest and during daily household chores. Transcripts of the audio files were executed and in December 2023, coding began.

Final Data Analysis was completed January 2024

### Preliminary Themes

- The intervention heightened feelings of grief and sadness, while lowered feelings of anxiety, anger and overwhelm.
- The forest atmosphere promoted social connection
- Forests precipitate the grieving process, making acceptance of the loss come with more ease
- Grief feels less overwhelming in a natural environment
- Participants reported significant improvements in being able to rest and relax.
- The forest environment facilitated the meaning making process.
- The forest atmosphere promoted existential thought processes and acknowledgement of death as part of the cycle of life.

### Components of Forest Therapy Intervention

|                            |                      |                   |
|----------------------------|----------------------|-------------------|
| Slowing Down               | Exploring the Senses | Nature Connection |
| Inviting Awe & Fascination | Mindfulness          | Breath Awareness  |
| Group Connections          | Creative Invitations | Ceremony & Ritual |

### Conclusions & Further Research

This preliminary pilot study gives sufficiently encouraging data to explore further studies in the area of forest therapy as a beneficial intervention for a bereaved population. The researcher aims to progress to PhD in May 2024 and explore the benefits of a longer Forest Therapy intervention for people going through traumatic losses.

### Contact

Liz Gleeson  
liz.gleeson@tus.ie

Supervisors Dr Frank Houghton & Jennifer Moran Stritch





## Research Question

How did the interactions of the Brehon Law system and Insular Christianity in Gaelic Ireland influence the development of Irish Society. A study of the implications on the legal and religious landscape that lead to Anglo-Norman Ireland.

## Summary of Work to Date

In the initial phases of my research since February, a substantial amount of time has been dedicated to comprehensive exploration, focusing on Brehon Law, the early church in Ireland, and Gaelic culture.

This emphasis on research is particularly crucial, given my background in law during my undergraduate studies. While legal history plays a minor role, my primary knowledge lies in modern common law. Therefore, it was imperative to establish a solid academic foundation in the historical field, aligning with my specific interests.

This emphasis holds significance in building a conceptual understanding of early Irish legal history, integrating my background in law with a broader historical perspective. This approach allows for the creation of a master's-level foundational framework pertinent to my research question. Another significant aspect of my work involved defining the scope and focus of my research.

At one point, I considered adding a comparative analysis of mediaeval Frankish law and Brehon law due to legal and cultural overlaps between these societies. However, I concluded that this would demand a level of detail exceeding the limits and timeframe of a master's program. Consequently, I opted to defer this aspect to a potential future study.

In summary, the early stages of my research involved extensive exploration of key themes, aligning my legal background with the nuances of Irish legal history. The subsequent focus on refining the scope ensured a more targeted and manageable research project within the constraints of a master's programme.

## Publication and Dissemination of research

While I'm not at the stage yet to publish my findings the following research journals would be most likely to be considered for publication.

The Journal of Legal History – Taylor & Francis  
Irish Economic and Social History – Sage  
Law Society Gazette Ireland – The Law Society of Ireland  
Studia Hibernica - Liverpool University Press  
Journal of the Royal Society of Antiquaries of Ireland - RSAI

## CATTLE, CHURCH & CASTLE

### THE HISTORICAL DEVELOPMENT OF IRISH LAW

Mark Flatley - K00242710 - mark.flatley@tus.ie  
Supervisors - Dr. P.J Ryan & Ann-Marie Dooley

## Introduction

Ireland's history spans thousands of years, marked by the arrival of many groups of people. These people established the foundation for Brehon Law, a complex system of social and political customs.

Scholars suggest the earliest proof of Brehon Law dates back to 200 BC, although written evidence only emerged in 500 AD with the introduction of a written language by the Christian Church. Brehon Law, at its time, was a progressive legal system, offering protections for property, noncombatants, and unprecedented rights for women. Importantly, these rights persisted even after the arrival of Christianity through missionaries from Britain.

Christianisation did not end Brehon Law but rather enhanced it through standardisation and the recording of land deeds by monasteries. The interplay between Brehon Law and Gaelic society, as well as their reciprocal influence on Christian teachings, led to the formation of a unique Christian sect known as the Insular Church. This sect embraced Gaelic culture and played a crucial role in spreading its influence across the British and Irish Isles and the continent, facilitating communication and trade.

My research focuses on precisely examining the effects and workings of Brehon Laws, the interaction of the Insular Church in standardising Brehon Law, and the roles both played in Gaelic society. Additionally, I explore the final years, decline, and ultimate destruction of both the Insular Church and Brehon Law in Ireland. The research aims to provide a comprehensive understanding of the interwoven dynamics between law, religion, and society during this historical period.

## Timeline of Future Work

- Jan 24 - Feb 24: Work on Chapter 1
- Mar 24: Finalisation on research and commencement of work on Chapter 2
- Apr 24 - May 24: Work on Chapter 2
- Jun 24 - Aug 24: Finalisation on research and commencement on Chapter 3, 4
- Sep 24: Finishing of work on Chapter 3, 4. Finalisation on research and conclusions for chapter 5
- Oct 24 - Dec 24: Work on Chapter 5
- Jan 25: First Draft
- Jan 25 - Mar 25 - Corrections and Final Draft
- Apr 25: Notification of Intention to Present for Examination
- May 25: Masters Viva





## Apart in Life but Together in Death: A Content and Thematic Analysis of a Pro-Suicide Website

1

### Introduction

The relationship between suicide and the internet has been described as paradoxical in nature. While the internet can facilitate access to content that assists recovery and educates individuals on preventing suicide, the internet can also be used as a tool to aid in the process of ending one's own life. Content available on pro-suicide forums and websites is ever-growing and in today's digitally connected world, content of this nature has never been more accessible.

This project explores content posted on a pro-suicide website with specific focus on three key areas- suicide methods, locations of suicide and suicide partnerships.

The researcher takes a secondary, mixed-method approach in gathering six months of found data pertaining to the three key areas specified above. All data then undergoes a process of reflexive thematic analysis.

A transdisciplinary approach has been adopted, which led to the exploration of literature from disciplines not traditionally associated with suicide such as geography, tourism, death and cultural studies. This dynamic approach has thus far offered unique perspectives from which to view suicide and has also highlighted potentially exciting and collaborative opportunities to address gaps in national policy and practical suicide intervention techniques.

2

### Researcher Profile



3

### Aims and Objectives

This study explores content posted on a pro-suicide website with the aim of generating new knowledge in three key areas: suicide methods, suicide locations and suicide partnerships.

Results from the three areas outlined, as well as an up-to-date lexicon on suicide in the digital age will be made available to key stakeholders with a view to informing up to date policy and person-centred approaches to an ever-evolving issue.

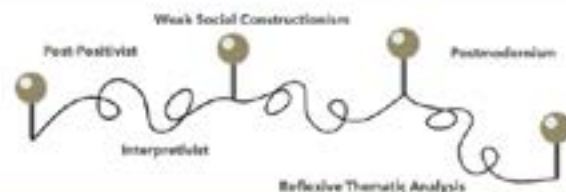


4

### Methodology

This transdisciplinary research has been conducted under the assumption that a singular reality or universal truth does not exist. Drawing on perspectives from post-positivist and interpretivist schools of thought, the researcher has identified weak social constructionism as the most suitable epistemological stance. Postmodernism is used as a theoretical framework from which to build upon.

Six months of data was collected in each of the three key areas using conceptual analysis techniques. All data then underwent a process of reflexive thematic analysis.



5

### Data Overview

- 6 months of data collected and analysed per key area (180 days each)
- Suicide Methods: 480 points > 104 codes > 9 themes.
- Suicide Locations: 840 points > 145 codes > 12 themes.
- Suicide Partnerships: 287 points > 13 codes > 4 themes.

### Special Focus Areas





## Experiences of weight and body shape changes during the menopausal transition

By M.B. Murphy, A. Lane, G. Cuskelly and P.M. Heavey



### Introduction

- Menopause marks the end of the female reproductive life span as signified by 12 months of amenorrhea, and is part of the natural aging process of the female reproductive system<sup>1</sup>
- It occurs at an average age of 51<sup>2</sup>, and is preceded by about 4 years of irregular periods<sup>3</sup>
- The journey from pre- to peri- to post-menopause is known as the menopausal transition (MT)<sup>4</sup>
- This stage is accompanied by hormonal changes which can result in a wide and diverse array of symptoms<sup>5</sup>
- About 80% of women find that symptoms affect normal daily activities<sup>6</sup>, with an impact on aspects such as quality of life, performance at work, and relationships<sup>9</sup>
- Weight gain is a major health concern for women during the MT<sup>6</sup>
- An increase in weight, body fatness and changes to body composition have been linked to perimenopause<sup>7</sup>
- These changes may be influenced by a variety of factors e.g., aging, stress, hormones, sedentary lifestyle, medications, etc.<sup>5</sup>
- There is a lack of research exploring experiences of weight and body shape during the MT

### Aim and objectives

- To explore the lived experience of the menopausal transition, in Ireland, with reference to symptoms, health and wellbeing, body shape changes and perception of weight
- To identify any lifestyle behaviours or strategies associated with a positive/negative body image and/or health during the menopausal transition
- To validate the need for additional research and to promote social innovation through future public health interventions

### Discussion and Conclusions

Previous qualitative research implies that the MT, has far-reaching effects on the lives of women<sup>10</sup>. This study had similar findings, suggesting that women are seeking support to navigate perimenopause and the weight and body shape changes that accompany this transition. Targeted lifestyle interventions are required, with a potential role for supportive weight management strategies. Further research is required to establish the connection between the MT, symptoms and changes to body shape and/or weight, to inform policies and future public health interventions.

### Methodology



**Menopause and its symptoms impact the lives of women**  
"It has affected my confidence, erm, it has affected me at home, and it has affected me at work. [...] it has had a massive effect. Absolutely huge! And it, kind of, has taken me by surprise, to be honest" (Sheila, 50y)

**Experience of weight and body shape is different**  
"But the weight- Oh my God! I went from 10 stone to 13 stone, and it all went in the, the worst places [...] The arms, and the belly, you know, and under the chin. Like, you know, you know, you look in the mirror and you see the classic cliché of the older woman" (Debbie, 49y)

**Trying to make sense of body shape and weight changes**  
"I was kind of thinking, am I going mad? Is this all in my mind? Am I gaining weight because I'm just... Am I eating more? Erm, am I feeling this way because it's just what happens? And erm, does it happen to other people?" (Louise, 50y)

**Participating in healthy lifestyle practices is challenging**  
"I'm 48 now [...] so at 40-ish, after my father's death and all of that, and all them episodes post 'that', I've never really felt motivated the way I used to. To get up and go, and do things" (Michelle, 48y)

**Women aspire to engage with healthy behaviours**  
"Your weight, and the foods that you eat, and all of these things are important to your overall health. And that, by extension, you know, they're going to help you with other symptoms as well, with other things" (Carole, 54y)

### Results

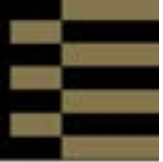
6 main themes were produced

**Body image during the MT**  
"And, um, I felt... I feel, and I still do now even, feel disgusting in my body [...] you don't feel as attractive as you did before it" (Michelle, 48y)

### References

- 1 WHO. Menopause. Published 2021. Accessed January 5, 2023. <https://www.who.int/news-room/fact-sheets/menopause>
- 2 Burt M, Borenstein E, Gartmann S, et al. The natural menopause transition for healthcare professionals. In: European Menopause and Andropause Society (EMAS) position statement. *Menopause*. 2021;28(10):1077-1083. doi:10.1093/men/abaa008
- 3 Janssen L, Janssen R. Management of the Menopausal. *Clin Obstet Gynaecol*. 2018;13(2):434-443. doi:10.1016/j.cob.2018.08.001
- 4 Janssen L, Janssen R, et al. Individual patterns of the stages of perimenopausal aging. *Menopause*. 2019;26(10):1611-1618. doi:10.1093/men/abaa008
- 5 Janssen L, Janssen R, et al. Menopausal symptoms and their management. *Endocrine-related diseases*. 2019;2019:1-10. doi:10.1080/17445019.2019.1641111
- 6 Janssen L, Janssen R, et al. The menopause and health dimensions of menopausal women in Ireland. 2021. Accessed August 15, 2022. <https://www.tus.ie/research/2021/08/15/menopause-and-health-dimensions-of-menopausal-women-in-ireland/>
- 7 Burt M, Borenstein E, Gartmann S, et al. 2018a. Menopausal symptoms and transitions in menopause in European menopause and andropause society (EMAS) position statement. *Menopause*. 2021;28(10):1077-1083. doi:10.1093/men/abaa008
- 8 Burt M, Borenstein E, Gartmann S, et al. 2018b. Menopausal symptoms and transitions in menopause in European menopause and andropause society (EMAS) position statement. *Menopause*. 2021;28(10):1077-1083. doi:10.1093/men/abaa008
- 9 Janssen L, Janssen R, et al. Individual patterns of the stages of perimenopausal aging. *Menopause*. 2019;26(10):1611-1618. doi:10.1093/men/abaa008
- 10 Janssen L, Janssen R, et al. Menopausal symptoms and their management. *Endocrine-related diseases*. 2019;2019:1-10. doi:10.1080/17445019.2019.1641111





## An Overview of the 'Accessing Progressing and Connecting' Project: An Investigation into the Support Necessary to Promote Social Inclusion at Third Level for Autistic Students

Sarah Hughes<sup>1</sup>, Dr Edith Walsh<sup>1</sup>, Dr Helena Lydon<sup>2</sup>, Dr Deirdre Walsh<sup>1</sup>  
Affiliations: <sup>1</sup>Technological University of the Shannon and <sup>2</sup>University of Galway.



### Introduction



Equality of access to higher education is a national priority. This is evident in recent governmental strategic planning documented in the National Access Plan 2022- 2028, which expresses a vision of striving towards a higher education student population which is more diverse and inclusive.



This project aligns with that vision as it relates to autistic students. The number of autistic students entering higher education is rising (Barnhill, 2016). Research is needed to ensure the needs of autistic students are appropriately met.



Whilst equal access is important, it is argued that emphasis should be placed on establishing how to best support students with diverse abilities to remain and succeed in higher education (Fernández-Batanero et al., 2022).



**Aim:** Gain an understanding of the current student experience of autistic students in Ireland, in particular the barriers and facilitators to social inclusion, the available supports and accommodations and finally, the first-hand experiences of autistic students.

### Proposed Methods



**Study 1:** A mixed methods systematic review to identify the barriers and facilitators to social inclusion for autistic students. The protocol is registered on PROSPERO and study screening has begun.



**Study 2:** A cross sectional survey will be undertaken to identify the current supports and accommodations in place for autistic students in higher education in Ireland.



**Study 3:** A qualitative study will be completed to gain insight into the first-hand experiences of autistic students in Ireland. The study will utilise a letter writing method.

### Public Patient Involvement

- Public Patient Involvement (PPI) is planned for studies 2 and 3.
- PPI enhances the quality, improves the relevance of and increases the impact of research. PPI aids the formulation of research questions communities view as important and the design and use of appropriate methodologies (HSE Research and Development, 2021).
- An **Expert Advisory Panel** comprised of up to 15 stakeholders will be formed, to identify the research priorities of the autistic community surrounding higher education and provide guidance and advice on the design and development of studies 2 and 3.

### Getting Involved in the Research

In the coming months, the Expert Advisory Panel will be set up to advise on the design of study 2. The panel will be involved in finalising research questions, designing study materials (information sheet, survey and consent questions) and in deciding the dissemination strategy.



### References

For a full list of references please scan the QR code below.





# ALIVE Intervention Proposal

## Affective Learning - Inspiring Values and Emotions in Secondary School Technology Education

Investigating The Affective Domain of Learning and Balanced Technological Capability in Technology Education

**Technology:** The Application of Science  
**Techné:** art, skill, craft, or the way, manner, or means by which a thing is gained.  
**Logos:** word, the utterance by which inward thought is expressed, a saying, or an expression.

### Introduction

The development of technological capability is outlined as a key goal of all four of the newly developed Irish Junior cycle technology subject specifications. These subjects are presented as Applied Technology, Graphics, Engineering and Wood Technology. It is common to find learning outcomes within the written curriculum of these subject specifications that address elements of technological capability from within the cognitive and psychomotor domains of learning.

This research explores the treatment of the affective domain of learning in technology education through the ALIVE intervention where an holistic approach for the delivery of technology education is proposed. The intervention emphasises the balanced treatment of the technological capabilities and aims to deliver an emancipatory vision where outcomes such as student well-being, motivation and designery aptitudes are placed at the core.



### Secondary School Technology Subjects:

- Junior Cert**
- (1) Applied Technology
  - (2) Engineering
  - (3) Graphics
  - (4) Wood Technology
- Leaving Cert**
- (1) Technology
  - (2) Design Communications Graphics
  - (3) Engineering
  - (4) Construction Studies
- Leaving Cert Applied**
- (1) Technology
  - (2) Graphics & Construction Studies
  - (3) Engineering

### Key Areas considered along with the Written Curriculum

The UNESCO Sustainable Development Goals (SDG)  
Global agendas are identified and explained within the 17 SDG's. The SDG's (origins date back to 192) deal with important key issues which are human centered and concerned with global citizenship. (United Nations, 2015)

The Affective Domain of Learning  
This domain includes the manner in which we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes: Receiving, Responding, Valuing, Organising and Characterising.

Junior Cycle (JC) Well-being Guidelines  
"The student experience contributes directly to their physical, mental, emotional and social wellbeing and resilience. Learning takes place in a climate focused on collective wellbeing of school, community and society." Framework for Junior Cycle (JCS, 2013 p.4)



The ALIVE intervention aims to explore how the subjects are taught and what is experienced by students and teachers

## Study 1: Investigating thresholds at different time points in a Technology Teachers Career



Education has three aims:

- the attainment of academic qualifications,
- socialisation into a community,
- becoming a wise human being. (Biesta, 2013)

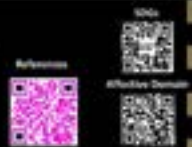


### Research Method

This is primarily qualitative research. Study 1 will inform and guide the design of the ALIVE intervention.  
The initial phase is focused on gathering data in order to gain an understanding of the participants' experiences and perceptions of technology education.  
This information will then inform technology education and classroom practice for the longer term enhancement of the experienced curriculum. In order to deliver a more balanced approach to fostering technological capability.



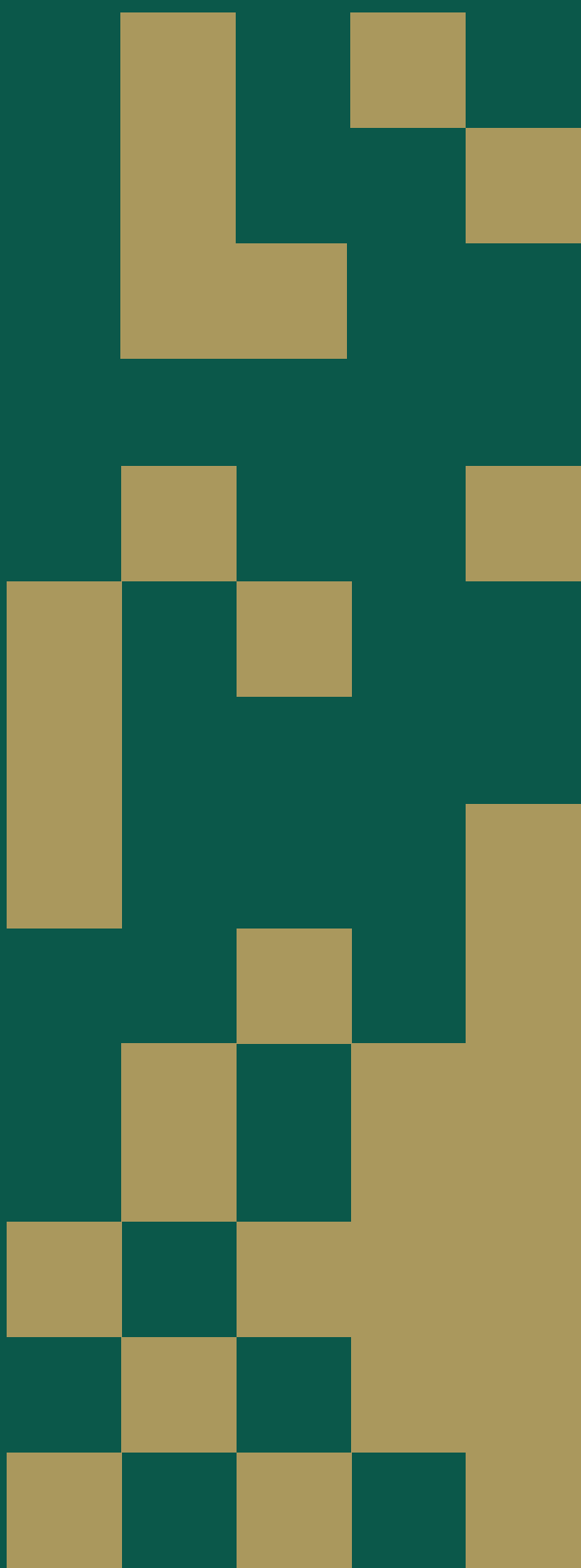
Technology makes us better learning and playing in child learning and playing in an adult, values of health, of thinking and making Global Citizens and the Sustainable Development goals.





# **Sustainable Development**







## Sustainable Solutions: Unpacking the Microbial Science of Reusable Meat Packaging

Alison Reid, Yvonne Cortese, Romina Pezzoli, Andy Fogarty, Declan Devine

PRISM Research Institute, Technological University of the Shannon: Midlands Midwest, Athlone.  
Corresponding Author: Alison Reid – A00159010@student.at.ie



Single use packaging makes up 99% of the packaging on the Irish market [1].



Reusable packaging is being produced as a response to regulations such as the EU Plastics Strategy (2030).



There is currently no reusable packaging in the context of fresh meat packaging.

### Background

The global production of 400.3 million metric tons of plastics in 2022 underlines the urgency to address plastic pollution. In Europe, food packaging constitutes a major market, and in Ireland, 99% of plastics are single-use [1]. To combat this, the need for sustainable alternatives is evident. This study explores the possibility of replacing single-use meat packaging with reusable alternatives. By focusing on the effects of weathering on surface changes and microbial interactions, using foodborne pathogens, the aim is to stimulate a reusable system. Through an exploration of the microbial environment, this study aspires to contribute to the development of a food-safe sustainable packaging solution.

### Method

The following method was designed based on ISO 4768-2003 [2]. 1cm x 1cm samples were cut from triplicate control, and weathered samples. Unwashed virgin material acted as the control. *E. coli* DSM 30083 and *B. cereus* DSM 31 inocula were prepared in Tryptic Soy Broth (TSB) to a final density of  $1 \times 10^8$  CFU/mL. Samples were transferred to a sterile 12-well plate and incubated with 4mL of inoculum for 24hrs at 30°C. After incubation, the samples were rinsed with sterile dH<sub>2</sub>O to remove non-adherent cells. Material samples were sonicated and vortexed in TSB to detach cells. The recovered cells were diluted before quantification using the 6x6 drop count method.

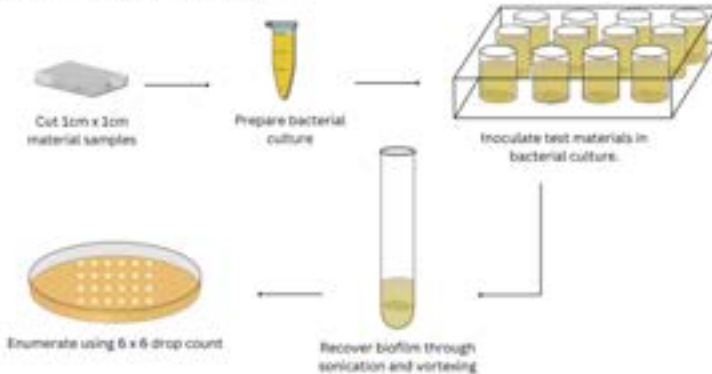


Figure 1: Method used to assess bacterial biofilm formation on weathered surfaces. Weathered samples (5, 10 and 15 washes) were compared to the control samples (0 washes) using a One-Way ANOVA. All data was normally distributed (Graphpad Prism 8.0.2).

### Results

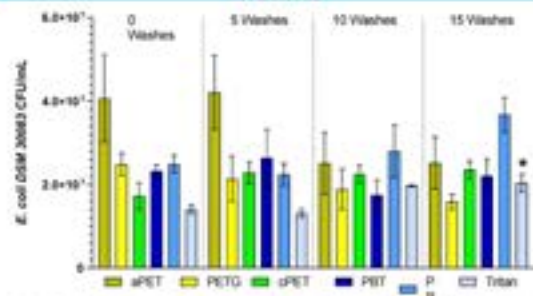


Figure 2: The formation of *E. coli* DSM 30083 biofilm in CFU/mL for aPET, PETG, ePET, PET, PP and Tritan for 0, 5, 10 and 15 washing cycles. Error bars represent SEM ( $n = 3$ ). All data is normally distributed. The \* symbol is used to indicate significant biofilm formation as seen for Tritan at 15 wash cycles ( $p = 0.0222$ ).

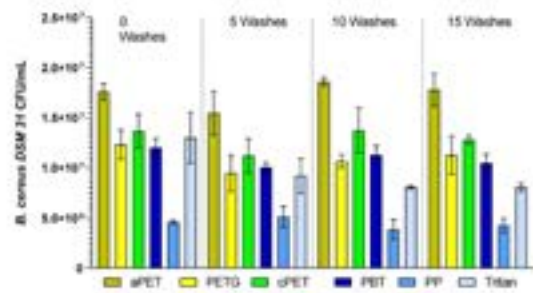


Figure 3: The formation of *B. cereus* DSM 31 biofilm in CFU/mL for aPET, PETG, ePET, PET, PP and Tritan for 0, 5, 10 and 15 washing cycles. Error bars represent SEM ( $n = 3$ ). All data is normally distributed. The \* symbol is used to indicate significant biofilm formation.

### Discussion

Of the materials tested, with the exception of Tritan, there were no significant variations in biofilm formation for any material using both *E. coli* DSM 30083 and *B. cereus* DSM 31, when compared to the unwashed virgin material ( $p \geq 0.1559$ ). Tritan showed a significant difference at 15 wash cycles for *E. coli* DSM 30083 which is likely due to biological variance, and not due to surface changes ( $p \geq 0.222$ ). The lack of significant variation implies that microbial adhesion was not influenced by surface weathering. While this highlights the potential use of these materials as sustainable alternatives, further investigation into the mechanisms of microbial attachment is necessary. Understanding the stability of the materials under various microbial conditions is crucial for the development of a food-safe, novel reusable meat package.

### References

- [1] Environmental Protection Agency. 2023. Waste packaging statistics for Ireland. [Online] Available at: <https://www.epa.ie/pressroom/press-releases/2023/waste-packaging-statistics-for-ireland-2023/>
- [2] International Organization for Standardization. 2003. Measurement method of anti-biofilm activity on plastic and other non-porous surfaces. <https://www.iso.org/standard/39000.html>
- [3] Coelho, P.M., Corina, E., Im Dousten, R., Worrell, E., 2020. Sustainability of reusable packaging: Current situation and trends. Resources, Conservation & Recycling. <https://doi.org/10.1016/j.resconrec.2020.105027>
- [4] Nahar, S., Sian, M., Linder, R., Hutton, R.L., Woolley, E., 2022. Challenges Associated with Cleaning Plastic Food Packaging for Reuse. Waste 1, 21–39. <https://doi.org/10.3390/waste1010021>
- [5] Onici-Goga, B., Juleita, M., Sechi, P., Borgogni, E., Karana, M., Grispold, L., 2020. New Trends in Meat Packaging. Microbiology Research 11, 56–67. <https://doi.org/10.3390/microbiom11020050>

### Acknowledgements

This work is supported by Horizon Europe – Project Buddie-Pac. Project 101059923, as supported by the European Commission.



### Get in Touch





## Exploring Oat Husks as Sustainable Building Material in Limestone-based Matrices

Alysson Larsen Benifacio, Dr. Paul Archbold

Sustainable Infrastructure Research Group (SUIR), Faculty of Engineering & Informatics, Technological University of the Shannon: Midlands, Athlone, Ireland

Corresponding e-mail: [a00278550@student.tus.ie](mailto:a00278550@student.tus.ie) ORCID: 0000-0003-4247-0353

Check out my webpage for detailed info and explore the content in a fun and easy-to-understand way!



This project aims to valorise oat husks by investigating their potential as a secondary phase in limestone-based matrices for use as a material in civil construction. The project is divided into four stages. At the base of the studies is the exploration of minerals present in husks as supplementary materials to cement and, subsequently, studies to understand the compatibility of the "whole particle" with cement until the apex of the research, forming composites with improved thermal performance.

Stage 4 involves developing cementitious composites with varying densities, combinations, and oat husk incorporation rates and then evaluating their thermal and mechanical performance to suggest practical applications and limitations.

Preliminary results indicate an enhancement in the thermal performance of the composites incorporating husks, pointing to potential suggestions for practical applications.



### STAGE 4

Prepare cementitious composites incorporating husks and assess their thermal and mechanical performance.

Stage 3 involves the geometric characterisation of oat husks, applying different limestone-based binders, and assessing how surface treatments affect extractive leaching, husk degradation, and composite mechanical performance. Furthermore, significant factors will be analysed using correlation according to the proportion of husks utilised.

Preliminary data show that coating treatments minimise component leaching from the particle, improving composite performance. Furthermore, when applying full aggregate replacement, a negative correlation between specific gravity and the mechanical strength of the composites is observed.

### STAGE 3

Assess the surface treatment and integration of oat husks in different binders and propose by regression a mixture design chart for cement-based mixtures incorporating only husks as aggregates.

To consider future uses of oat husks, the cement interaction with husk extractives was measured to determine whether the extractives interfered with cement hydration, and also efficient ways to remove them by washing were investigated.

The findings showed that the cement's strength development and final setting are impacted significantly by these extractives when oat husks degrade. Longer immersion times work better for removing extractives than increasing the number of cycles, and hot water is more effective.

### STAGE 2

Investigate how specific substances in oat husks hinder cement hardening and explore water washing for removal.

Experiments were conducted to explore the possibility of using elements from oat husk ashes, particularly amorphous silica, as a substitute for cement if they react effectively with slaked lime.

In conclusion, low reactivity in ashes produced at 600°C was observed, and only approximately 21.62% of the necessary elements, with 21.2% being silica, were found.

### STAGE 1

Produce oat husk ashes and their reactivity with slaked lime.



IT ALL BEGINS AT THE BOTTOM WHEN BUILDING A MORE SUSTAINABLE FUTURE.





## Turning Sea Bounty into Sustainable Solution!

Thermal, Spectroscopic and Mechanical Characterisation of Biopolymer Blends Containing Chitosan Sourced from Crab Shell Waste

Anis Sofia Sufian<sup>1, 2\*</sup>, Crevan O'Donnell<sup>1</sup>, Luke Geever<sup>1</sup>

<sup>1</sup>Materials Research Institute, Technological University of The Shannon: Midlands Midwest, Athlone Campus, Co. Westmeath, Ireland

<sup>2</sup>Faculty of Chemical Engineering Technology, Universiti Malaysia Perlis (UniMAP), Arau, Perlis, Malaysia

\*Email: A00278632@student.tus.ie / anissafia@unimap.edu.my / anissofiasufian@gmail.com

### 1. Introduction

Seafood, seen as both a healthy and indulgent option, plays a vital role in global diets, providing the essential protein<sup>1</sup>.

With the expanding population, meeting the growing demand for seafood is imperative but raises concerns about the substantial waste it may generate, posing environmental challenges and sustainability issues<sup>2</sup>.

Transforming waste into alternative materials enhances the value of a material<sup>3</sup>, turning it into a potential resource for end-product applications.

### 3. Methodology

**CS** (by-product of crab shell waste through chemical extraction from previous work), **PLA**, **ST** and **PBAT** composed of **neat** and **binary** (50/50) combinations were employed for the fabrication of the biopolymer blends.

**Hot-melt extrusion** was used for the compounding process using a Thermo Scientific Process 16 twin-screw extruder.

The extruded samples were injection moulded by the Arburg Allrounder **injection moulding** machine. A form of dumbbell and rectangular bar samples were utilised for the mechanical testing, thermal and FTIR analysis.



Figure 1: The Compounding Process of Neat Biopolymers and 50/50 Blends

### 5. Conclusions

The trends in the  $T_g$  and  $T_m$  curves are notably apparent between the neat and 50/50 blends, particularly following the introduction of CS in PLA.

The structural changes showed evidence of chemical interactions in the 50/50 blends, with significant effects observed when CS is introduced.

Utilising CS sourced from crab shell waste led to improved mechanical properties in PLA, PBAT and ST, respectively.

**Subsequent work** will involve incorporating CS into additional sets of blends to determine the optimal combination for creating a novel biopolymer suitable for commercial product production.

### 2. Aim

To establish blends of biopolymer, incorporating chitosan (CS) extracted from crab shell waste with polylactic acid (PLA), starch (ST) and polybutylene adipate terephthalate (PBAT).

To assess the thermal, spectroscopic and mechanical properties of the resulting blends.

### 4. Results

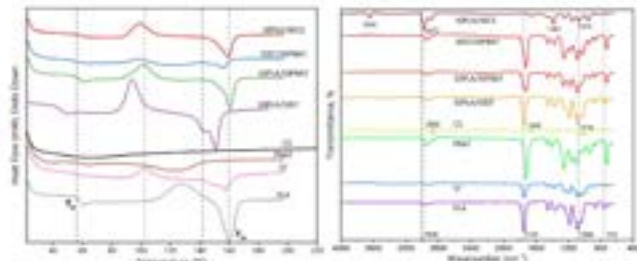


Figure 2: Comparison of DSC traces of Neat and 50/50 Blends

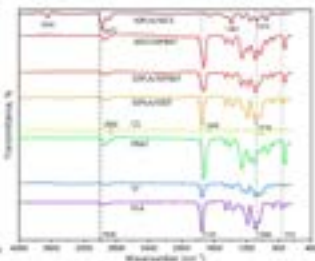


Figure 3: FTIR Spectra of Neat and 50/50 Blends

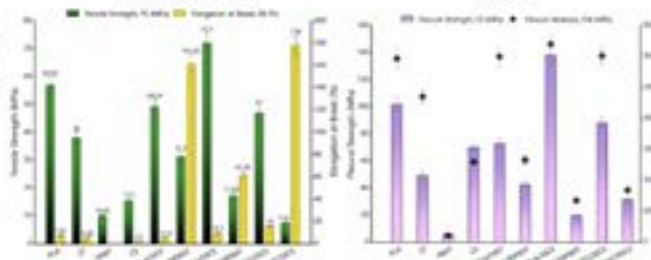


Figure 4: Tensile Properties of Neat and 50/50 Blends

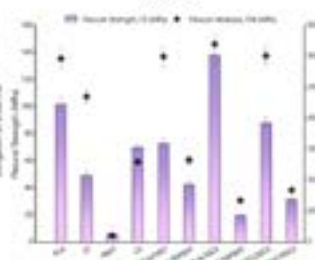


Figure 5: Flexural Properties of Neat and 50/50 Blends

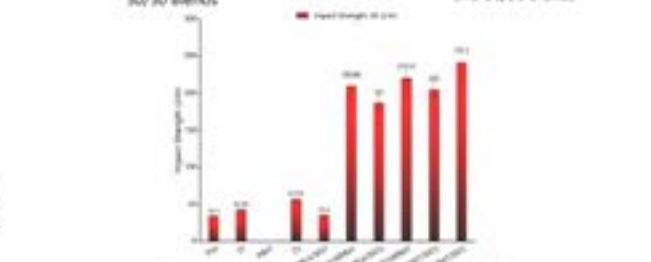


Figure 6: Impact Strength of Neat and 50/50 Blends

### References

- <sup>1</sup>Pakizeh et al. (2021). doi:10.1016/j.eurpolymj.2021.110709
- <sup>2</sup>Fearghail et al. (2018). doi:10.4172/2380-2391-c2-005
- <sup>3</sup>Rasti et al. (2017). doi:10.22037/jpr.2017.1963

### Acknowledgement

This research is funded by the TUS Presidential Doctoral Scholarship and Enterprise Ireland.



Applied Polymer Technologies

### Author Info



ORCID



## Antimicrobial and Antibiofilm Properties of Lipids against *Streptococcus mutans*

Aoife Mahy<sup>1</sup>, Dr. Carmel Kealey<sup>1</sup>, Dr. Damien Brady<sup>1</sup>, Dr. Noel Cahaly<sup>2</sup>

<sup>1</sup>Dept. of Pharmaceutical Sciences and Biotechnology, Technological University of the Shannon, Midlands Midwest Athlone<sup>1</sup>

<sup>2</sup>Southeast Technological University<sup>2</sup>

<sup>3</sup>Bioscience Research Institute (BRI)<sup>3</sup>

<sup>4</sup>Applied Polymer Technologies (APT)<sup>4</sup>



### Introduction

Planktonic bacteria form biofilms, microbial aggregates embedded within extracellular polymeric substances (EPS) found attached to abiotic or biotic surfaces [1,2]. EPS contains exopolysaccharides, nucleic acids, proteins and lipids forming a protective matrix surrounding bacteria [3]. Bacteria attach to EPS facilitating cell-cell communication [4]. Biofilm matrix influences microbial behaviour, virulence and tolerance to antimicrobials [5,6].

Biofilms are responsible for many infections from chronic wounds, cystic fibrosis, dental caries, periodontitis, medical device implications and dental implant failure. Biofilms within the oral cavity are responsible for initiation of gingivitis, dental caries and the progression of periodontal disease [7].

### Oral Biofilm Formation

The oral microbiome is a complex environment inhabited by bacteria, archaea, fungi, protozoa and viruses [7,8]. The oral cavity represents the second largest microbiome in the human body [9], with 775 prokaryotic taxa recorded [10]. It offers a perfect location for bacterial growth providing a warm environment, saliva offers moisture, transport of nutrients, maintains a pH of 6.5-7 and contains adhesive components constituting the acquired pellicle to which bacteria adhere [11].

Oral biofilms form on soft tissues and hard surfaces such as teeth and dental restorative materials [12]. Biofilm formation in the oral cavity displays organisation, microbial succession and are formed in a sequential manner [13]. Biofilm development on a substratum involves four stages, initial attachment of cells onto the surface, early development, maturation and dispersal of planktonic cells [14].

### Biofilm Formation



Figure 1. Biofilm formation on tooth surface

### *Streptococcus mutans*

*S. mutans* plays a central role in development of dental caries as this microbe metabolises dietary carbohydrates, expresses acidogenic and aciduric properties responsible for decreasing pH [15,16]. Microbial dysbiosis occurs when *S. mutans* dominates oral biofilms resulting in acidic biofilm microenvironments, reducing abundance of acid-sensitive commensals thereby creating a pathogenic biofilm [17,18].

### Antimicrobial Lipids

Antimicrobial lipids (AMLs) and free fatty acids have been investigated as antibiofilm agents due to their promise as potential alternatives to conventional antibiotics [19]. AML activity depends on carbon chain length, position and orientation of double bonds influencing their three-dimensional shape and biological activity. Their non-specific mechanism of action and anti-inflammatory properties are attractive characteristics in treatment of diseases of the oral cavity [20].

### Aim

To use lipids as an antimicrobial and antibiofilm agents against *Streptococcus mutans*

### Project Overview

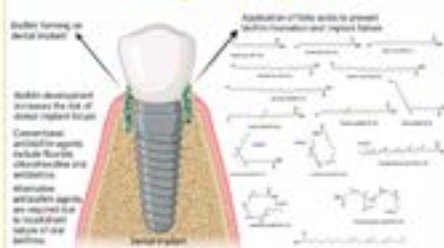


Figure 2. Implications of biofilm formation on dental implants.

### Methods

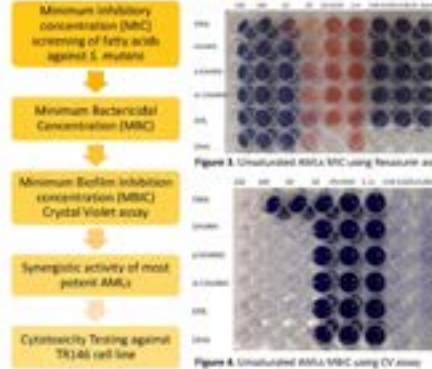


Figure 3. Unsat AMLs MIC using Resazurin assay

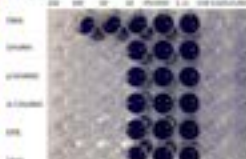


Figure 4. Unsat AMLs MIC using CV assay

### Discussion

- Interference with bacterial growth occurs with unsaturated LCFA's containing at least one or more double bonds within the lipid structure.
- Oleic acid (C18:1 n-7)  $\gamma$ -Linolenic (C18:3 n-6) and EPA (C20:5 n-3) reduced *S. mutans* growth (P value 0.0104), while linoleic acid (C18:2 n-6) interfered with *S. mutans* growth (P value 0.0090).
- DHA (C22:6 n-3) was bactericidal as this AML inhibited growth of *S. mutans* (P value <0.0001).
- Long chain polyunsaturated fatty acids reduced biofilm formation at 10  $\mu$ g/ml,  $\gamma$ -Linolenic (75%),  $\alpha$ -Linolenic (85%), EPA (47%).
- DHA is most promising AML as it reduced biofilm formation to 8% (P value <0.0001), displayed greatest log reduction (5.8) and reduced CFU/ml to  $(2.45 \times 10^7)$  at 10  $\mu$ g/ml.
- Synergistic activity was observed when AMLs were used in combination improving antibiofilm activity of  $\gamma$ -Linolenic,  $\alpha$ -Linolenic and EPA (P value <0.0001).
- AMLs displayed cytotoxicity; however, cell damage did not exceed that of CHX at 40%.  $\alpha$ -Linolenic displayed protective effects on TR146 cells with 67% cell viability.

### Results

As seen in the growth curve below unsaturated lipids at a concentration of 10  $\mu$ g/ml displayed most antimicrobial activity against *S. mutans* growth.

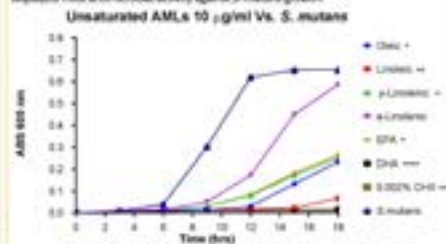


Figure 5. Growth curve showing long chain unsaturated AMLs at 10  $\mu$ g/ml

Log reduction results agree with growth curve. Antibiofilm activity was observed with  $\gamma$ -Linolenic,  $\alpha$ -Linolenic, EPA and DHA.

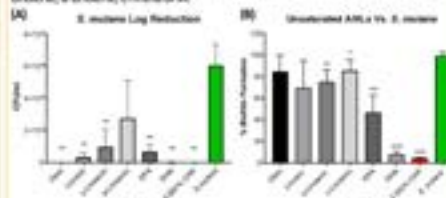


Figure 6. (A) Log reduction of *S. mutans* against long chain unsaturated AMLs at 10  $\mu$ g/ml (B) Percentage biofilm formation of *S. mutans* against long chain unsaturated AMLs at 10  $\mu$ g/ml

Synergistic activity of most potent AMLs were tested in combination of 10  $\mu$ g/ml

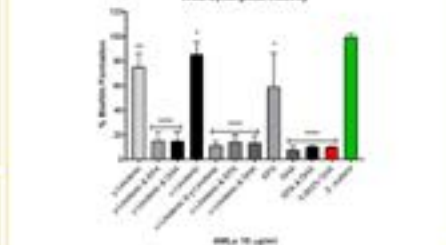


Figure 7. Percentage biofilm formation of *S. mutans* against combinations of AMLs at 10  $\mu$ g/ml

Cell cytotoxicity testing was carried out on oral TR146 cell line using LDH assay

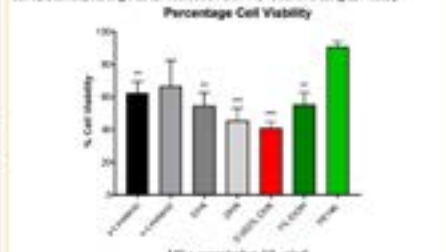


Figure 8. Cytotoxicity of Unsat AMLs vs. *S. mutans* at 10  $\mu$ g/ml

### Conclusion

- Lipid structural orientation, chain length and presence of double bonds has an influence on antimicrobial and antibiofilm activity.
- Long chain unsaturated fatty acids containing one or more double bonds display best antimicrobial and antibiofilm activity against *S. mutans*.
- Long chain polyunsaturated lipids  $\gamma$ -Linolenic,  $\alpha$ -Linolenic and EPA disrupted *S. mutans* growth.
- Omega-3 fatty acid DHA is bactericidal and exhibits potent antibiofilm activity making it the most promising AML tested.
- Activity of DHA was comparable to CHX, the gold standard antimicrobial used for oral hygiene.



Figure 8. Chemical structures of polyunsaturated Omega-3 lipids (EPA and DHA).

### Future work

- Efficacy of fatty acids against oral bacterial: *Streptococcus salivarius*, *Streptococcus sanguinis*, *Streptococcus mitis*, *Streptococcus oralis*, *Fusobacterium nucleatum* and *Porphyromonas gingivalis*.
- Evaluation of AMLs against dual and multispecies biofilms.
- Surface biofilm inhibition on hydroxyapatite and titanium disks to mimic tooth surfaces and dental implants, respectively.
- Effect of artificial saliva on AML activity.
- Confocal and SEM imaging of AML biofilm inhibition.

### References

1. Bhatia, S., et al. (2018) Biofilm formation and its role in antibiotic resistance. *Journal of Clinical Pharmacy and Therapeutics*, 43, 1-10.

2. Bhatia, S., et al. (2019) Biofilm formation and its role in antibiotic resistance. *Journal of Clinical Pharmacy and Therapeutics*, 44, 1-10.

3. Bhatia, S., et al. (2020) Biofilm formation and its role in antibiotic resistance. *Journal of Clinical Pharmacy and Therapeutics*, 45, 1-10.

4. Bhatia, S., et al. (2021) Biofilm formation and its role in antibiotic resistance. *Journal of Clinical Pharmacy and Therapeutics*, 46, 1-10.

5. Bhatia, S., et al. (2022) Biofilm formation and its role in antibiotic resistance. *Journal of Clinical Pharmacy and Therapeutics*, 47, 1-10.

6. Bhatia, S., et al. (2023) Biofilm formation and its role in antibiotic resistance. *Journal of Clinical Pharmacy and Therapeutics*, 48, 1-10.

7. Bhatia, S., et al. (2024) Biofilm formation and its role in antibiotic resistance. *Journal of Clinical Pharmacy and Therapeutics*, 49, 1-10.

8. Bhatia, S., et al. (2025) Biofilm formation and its role in antibiotic resistance. *Journal of Clinical Pharmacy and Therapeutics*, 50, 1-10.

9. Bhatia, S., et al. (2026) Biofilm formation and its role in antibiotic resistance. *Journal of Clinical Pharmacy and Therapeutics*, 51, 1-10.

10. Bhatia, S., et al. (2027) Biofilm formation and its role in antibiotic resistance. *Journal of Clinical Pharmacy and Therapeutics*, 52, 1-10.

11. Bhatia, S., et al. (2028) Biofilm formation and its role in antibiotic resistance. *Journal of Clinical Pharmacy and Therapeutics*, 53, 1-10.

12. Bhatia, S., et al. (2029) Biofilm formation and its role in antibiotic resistance. *Journal of Clinical Pharmacy and Therapeutics*, 54, 1-10.

13. Bhatia, S., et al. (2030) Biofilm formation and its role in antibiotic resistance. *Journal of Clinical Pharmacy and Therapeutics*, 55, 1-10.

# Circularity of High-Performance Flexible Packaging, from Multilayer to Monolayer Film Structures

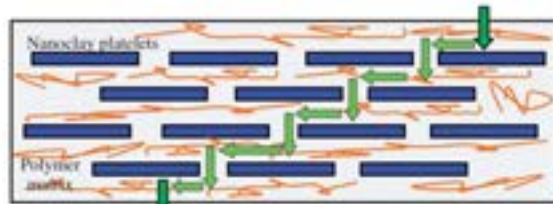
Ciara Stynes<sup>1</sup>, Patrick Doran<sup>2</sup>, Noel Gately<sup>3</sup>, Golnoosh Abdeali<sup>2</sup>, Romina Pezzoli<sup>1</sup>  
<sup>1</sup>PRISM Research Institute, Technological University of the Shannon (TUS), <sup>2</sup>Faculty of Engineering & Informatics, TUS, <sup>3</sup>Applied Polymer Technologies, TUS

## Introduction

Globally there has been a push to move towards a closed loop circular economy that aims to minimise waste, prolong material use and decrease the demand on raw material. A part of this push is to move away from multilayer films, where the layers of films can't be recycled together and towards a mono material.

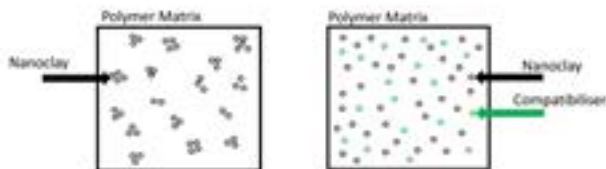
## Creating a Tortuous Path

Each layer in multilayer films have a specific role they fulfil, this can vary wildly depending on the application. The aim of the project is to fulfil these requirements with a single layer film that can be recycled. Polyethylene has a good water barrier but a poor oxygen barrier. Adding nanoclay to the matrix has been shown to make the oxygens path through the matrix more tortuous and increases the materials oxygen barrier.



[2] Nanoclay Creating a Tortuous Path

Adding nanoclay has a different strategy where instead of adding layers to provide the different barriers, the nanoclay creates a tortuous path.



The issue with adding nanoclay to the matrix is it tends to clump together. To alleviate this a compatibiliser is added that mixes well with both the nanoclay and matrix and helps increase the dispersion.

## Goals

Assess the effectiveness of EGMA as a compatibiliser on the dispersion of nanoclay in the polyethylene matrix.

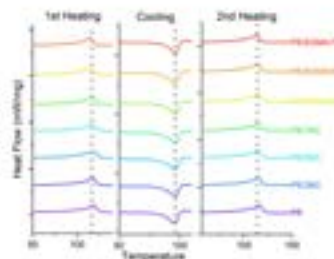
Compare how adding the compatibiliser effects the barrier properties of the material.

Along with assessing the beneficial properties of the compounded material, the mechanical properties need to be maintained to be a useful packaging material

[1] M. Kibdry, B. Yousef, H. Fu, and K. Lau, 'A critical review on the manufacturing processes in relation to the properties of nanoclay/polymer composites', *J. Compos. Mater.*, vol. 47, no. 9, pp. 1093-1115, Apr. 2013, doi: 10.1177/0021998312445592.

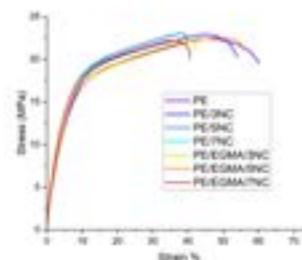
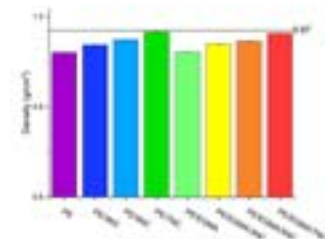
[2] RecyClass, 'Design for Recycling Guidelines'. Accessed: Mar. 20, 2023. [Online]. Available: <https://recyclclass.eu/recyclability/design-for-recycling-guidelines/>

## Results



- DSC assessed the melting and crystallisation peaks of compounded materials.
- There is minimal difference between the melting peaks and crystallisation peaks.
- This shows the nanoclay doesn't behave as a nucleation agent.

- Adding Nanoclay increased the density of the material.
- Adding compatibiliser slightly decreased the density.



- The tensile results show minimal difference in the young's modulus.
- There was a slight increase in the elongation at break in samples with compatibiliser.

## Conclusion

- The DSC results minimal difference in the crystalline structure, this indicates the material should maintain its chemical resistance properties.
- Density is very important for the recycling of PE for it to remain in the correct waste stream. The limit for density recommended by RecyClass is 0.97 g/cm<sup>3</sup> [2].
- There is minimal difference between the Young's Modulus showing the material remains suitable for packaging.
- Future testing is required to assess any changes in the barrier the properties of the material.



Find Me On ORCID



The Applied Polymer Technologies Gateway (APT) is co-funded by the Government of Ireland and the European Union through the ERDF (European Regional Development Fund) under the Operational Programme 2021-27.



**TUS**  
 Technological University of the Shannon  
 Midlands Midwest  
 Oideas Teicneolaíochta na Sionainne  
 Lár Theamhar Láir

**TUS Research**



## Promising DG19 *Streptomyces* spp. Strain isolated from plastic-polluted sites with Upcycling Potential as Antimicrobial Producer using PET precursor-supplemented productive media.

Garza Herrera, Diana Alicia<sup>1</sup>; Mojčević, Marija<sup>1</sup>; Nikodinovic-Runic, Jasmina<sup>2</sup>; Brennan-Fournet, Margaret<sup>1</sup>

<sup>1</sup>Materials Research Institute, Technological University of The Shannon- Midlands Midwest, <sup>2</sup>Institute of Molecular Genetics and Genetic Engineering – Belgrade, Serbia

### INTRODUCTION

It is estimated that approximately 60% of plastics produced since 1950 have accumulated in landfills[1]. In response, solutions have emerged to mitigate these consequences. Notably, Microbial degradation has shown promising results in the bioremediation of plastic pollution, with the constant discovery and study of Enzymes and Microorganisms ('MO') capable of metabolising a wide variety of polymers such as the highly pollutant Polyethylene terephthalate ('PET') and its monomer, Terephthalic Acid ('TPA'), also used for manufacturing adhesives, dyes and coatings which persist in the environment [2,3]. Actinobacteria, especially *Streptomyces* spp. are recognized for their ability to produce a diverse array of secondary metabolites, with a broad spectrum of biological activities, including antimicrobials. [4] Within this context, the exploration of microbial degradation not only addresses the removal of plastic waste but also holds the potential for upcycling by its use in the production of valuable metabolites. For this study, antimicrobial activity from possible metabolites obtained by *Streptomyces* spp. previously isolated from targeted sites with heavy content of plastic pollution, was analysed.

### METHODS

Spore suspensions (15 µl) of selected *Streptomyces* spp. DG19 isolated from plastic-polluted sites previously screened for enzymatic activity in TPA and PET supplemented-agar assays, were inoculated into vegetative medium (Maltose 15 g/L, Tryptone Soy Broth ('TSB') 8 g/L, Yeast Extract 4 g/L, CaCO<sub>3</sub> 2 g/L) and incubated at 30°C for 48 hr, 180 rpm) to use as preculture used for inoculation (1%, v/v) of JS Media in three different variations : JS CL (Glucose 20 g/L, Starch 20 g/L, Mannitol 15 g/L, Soybean flour 30 g/L, CaCO<sub>3</sub> 10 g/L), JS M TPA (Glucose 10 g/L, Terephthalic acid ('TPA') 10g/L, Starch 20 g/L, Mannitol 15 g/L, Soybean flour 30 g/L, CaCO<sub>3</sub> 10 g/L) and JS TPA (Terephthalic acid ('TPA') 20g/L, Starch 20 g/L, Mannitol 15 g/L, Soybean flour 30 g/L, CaCO<sub>3</sub> 10 g/L in Erlenmeyer flasks (1:5) at 30°C, 180 rpm for 14 days.

In order to evaluate antimicrobial activity, the bacterial cultures were subjected to extraction with Ethyl acetate (EtoAc) (1:1), for 12 h at 150 rpm, centrifuged and the EtoAc extract was recovered and after evaporation the resulting solid extracts were resuspended in Dimethyl sulfoxide ('DMSO') to a concentration of 50 mg/ml (Figure 2). Tryptone Soy Agar ('TSA') plates were inoculated by spreading it with a sterile cell spreader with *S. aureus* and sterile discs with 10 µl of the extracts were placed in the centre. Plates were incubated at 37°C, for 24hr. Assays were done in triplicates. (Figure 1) Negative controls with extract obtained of the media without bacterial presence under same conditions were done.

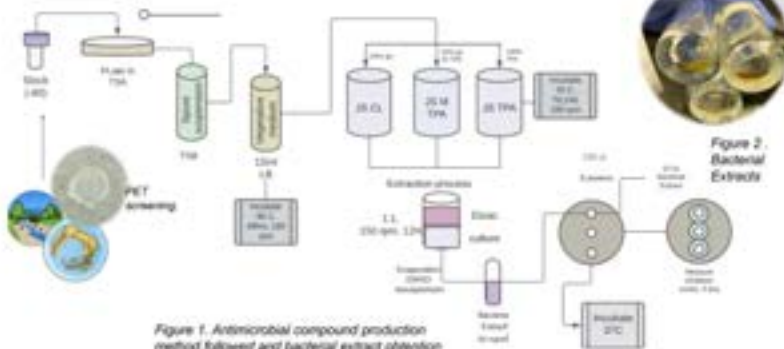


Figure 1. Antimicrobial compound production method followed and bacterial extract obtention

### RESULTS

- Productive Media JS M proved to have the best results on Gram-positive bacteria: *S. Aureus*, with bigger noticeable inhibition halos compared to extracts from JS CL and JS TPA as seen in Figure 3
- JS CL extract average of inhibition zone diameter was 8 mm, while JS M was 15.5 mm, almost doubling it. JS TPA average of 1 mm., which showed technically no inhibition, as seen in negative controls.

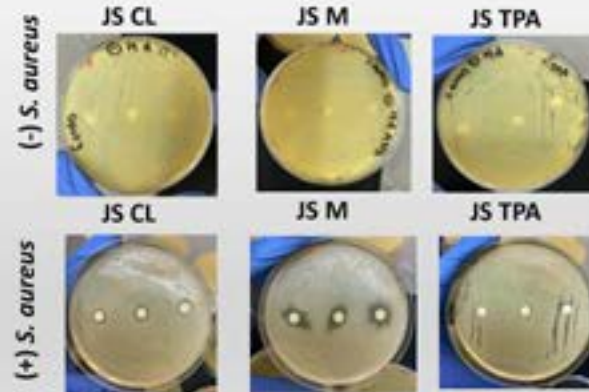


Figure 3. Negative controls of uninoculated media (top) showing no presence of inhibition zones, compared to extract assays of media inoculated with DG19

### CONCLUSIONS

- Assays proved that certain metabolites produced by DG19 had antimicrobial activity against *S. aureus*
- Polymer monomers like TPA proved that can be repurposed as a carbon source for productive media to obtain valuable metabolites, achieving circularity of polymers
- Further analysis in determining the exact compounds with antimicrobial activity GC-MS and HPLC need to be carried out to select and isolate such compound
- Additional benefits underscore the multifaceted impact of identifying and studying polymer-degrading strains.



**REFERENCES**

1. Zhou B et al. (2017) Science Advances, 3(2), 1-11
2. Xu L et al. (2022) Frontiers in Microbiology, 13, 898888
3. Zhou B et al. (2017) Science Advances, 3(2), 1-11
4. Zhou B et al. (2017) Science Advances, 3(2), 1-11



**Diana Garza Herrera**  
dgarza@tus.ie  
@dgarzaher  
**Marija Mojčević**  
mmojcevic@tus.ie  
**Jasmina Nikodinovic-Runic**  
jrunic@imge.rs  
**Margaret Brennan-Fournet**  
mbf@tus.ie  
**Garza Herrera**  
dgarza@tus.ie  
**Mojčević**  
mmojcevic@tus.ie  
**Nikodinovic-Runic**  
jrunic@imge.rs  
**Brennan-Fournet**  
mbf@tus.ie

Funding for this project was provided by EU Horizon Grant Funds by Technological University of the Shannon Midlands Midwest (TUS) and was supported by the National Natural Science Foundation of China (grant number 81673001) and the National Natural Science Foundation of China (grant number 81673001) and the National Natural Science Foundation of China (grant number 81673001).





## Sustainable Urethane-Alkyd Coatings Derived from Camelina Oil Monoglycerides

Elham Nadim, Pavan Paraskar, Mohammadnabi Hesabi, Emma Murphy and Ian Major\*  
PRISM Research Institute, Technological University of Shannon

\*Correspondence: [ian.major@tus.ie](mailto:ian.major@tus.ie)

### ABSTRACT

The growing focus on sustainable plant-based resources, has driven scientific efforts to replace petroleum-based materials in various industries. Vegetable oils as a sustainable resource, are particularly notable for their inherent advantages. Alkyd resins, a type of polyester resin, are renowned for their exceptional qualities, including excellent colour retention, high gloss, and resistance to solvents could be derived from plant oils. Particularly, plant-based non-oxidizing alkyds which serve have found significant use in the production of polyurethanes (PU).

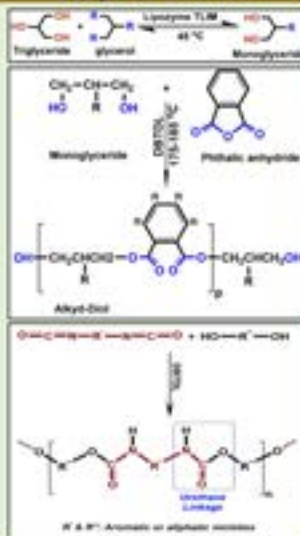
### Introduction

Crude Camelina oil (CO) was modified to be used as alkyd-diol in PU formulation. The process initiated with the glycerolysis of CO, catalysed by a cost-effective immobilized lipase, followed by esterification with phthalic anhydride as dibasic acid. The synthesized alkyd-diol was then used in the production of high performance PU coating.

#### Why Camelina?

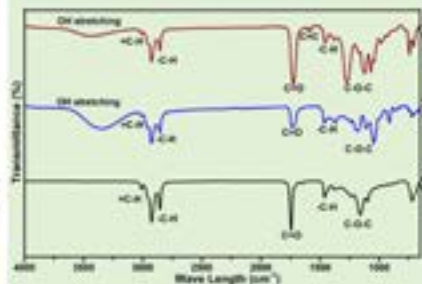
- Non Edible
- Annual Crop that Survives Winters
- Shallow Roots -Less Water to Grow
- Short Growing Season
- Dual-Cropping with Soybean

### Experimental



### Results and Discussion

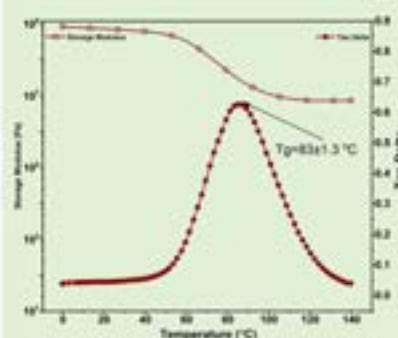
Titration technique and FTIR were used to confirm insertion of OH groups in CO.



FTIR analysis of CO, monoglyceride (MAG) and Alkyd-diol (PAn)

Successful insertion of OH functionality in CO

| Sample | OH # (mg of KOH/g) | Acid # (mg of KOH/g) | Reaction Time (h) |
|--------|--------------------|----------------------|-------------------|
| CO     | 9-10               | 0.95±0.2             | -                 |
| MAG    | 325-326            | 20±0.8               | 24                |
| PAn    | 213±4              | 977                  | 6                 |



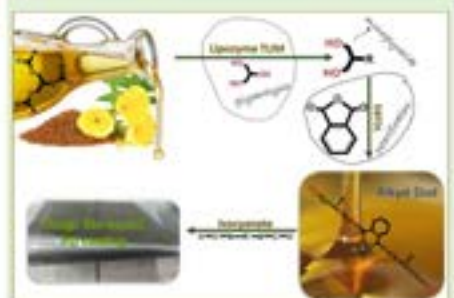
DMA analysis conducted on CO based PU showing its outstanding thermal stability

Physio-mechanical properties of Bio-PU from CO

| Impact resistance (ft. lb) | Flexibility (Conical Mandrel) | Gloss (at 20°) | Adhesion (Cross cut) | Hardness (Oscillations) |
|----------------------------|-------------------------------|----------------|----------------------|-------------------------|
| Pass                       | Pass                          | 90±1.3         | 5B                   | 147±3                   |

### Conclusion

This study successfully achieved its primary goal of synthesizing alkyd polyols from a non-edible plant oil source, CO, for the formation of urethane linkages with isocyanates. The produced coating exhibited excellent adhesion, toughness, and overall mechanical performance due to long fatty acid chains in the plant oil, which impart flexibility, along with a high OH number, efficient crosslinking.



### Reference

-Nadim, E., Paraskar, P., Murphy, E.J., Hesabi, M., Major, I. *Ind. Crops Prod.* 204, 117274  
 -Doke, R.B., Paraskar, P.M., Rajput, Y.N., Kulkarni, R.D.; *Eur. J. Lipid Sci. Technol.* 124, 2100171–2100185.  
 -Javni, I., Petrovic, Z.S., Guo, A., Fuller, R.; *J. Appl. Polym. Sci.* 77, 1723–1734.  
 -Pan, X., Webster, D.C.; *ChemSusChem* 5, 419–429







## Design and analysis of the application of 3D-printed composite sandwich structures for the use in an airless tyre.

Authors: Evan Looby<sup>1</sup>, Amit Haldar<sup>2</sup>

<sup>1,2</sup> Department of Mechanical and Automobile, TUS, Limerick, Ireland

### Introduction

With the increasing necessity for the use of sustainable composite materials for the use in many industries especially automotive, lightweight, composite sandwich structures have various application depending on the properties needed such as strength, vibration resistant, load bearing, shock absorbing and enhanced performance over solid core structures.

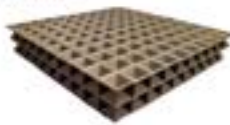


Figure 1: 3D Honeycomb sandwich structure

Why is there a need for Airless Tyres?, Why is it worth changing from a classic pneumatic tyre and what makes Airless tyres better.

- Tyre waste, **25%** of tires are wasted each year which is approximately **10,940 tonnes**.
- **280 million** tires are discarded each year in America alone.
- Tire particles account for **5-10%** of ocean plastic pollution.
- Use of sandwich structures to reduce that waste and reduce the cost of owning an automobile for consumers.

### Objectives

- Conduct a critical literature review on airless tyres and the application of composite sandwich structures in their design.
- Explore sustainable composite materials with suitable properties for airless tyre applications.
- Make design changes to airless tyre model.
- Analysis of airless tyre model and individual sandwich structure layers and components.
- Comparison of analysis results between current airless tyre designs and pneumatic tyres.

### Literature review

The academic literature review presented and compared the findings of published works relating to

- An overview of pneumatic tyres.
- Evolution of airless tyres and their operational principles.
- Advantages and disadvantages, the use of composite materials and the use of composite sandwich structures.

To begin with saying that the **tyre** is one of the most **vital** and **fundamental** components of a vehicle as it is the only point of contact between the vehicle the driving surface. A pneumatic tyre consists of an airtight rubber ring filled with pressurized air that provides a

cushioning effect for the tyre between the vehicle and the driving surface. The first iteration of an airless tyre was in **1982** by Goodyear and a Swedish engineer Hans Erik Hansson.



Figure 2: The Composite wheel (2017)



Figure 3: Michelin Airless Tyre



Figure 4: Hankook Airless Tyre

The use of composite sandwich structures has been advances a developed majorly in recent years with honeycomb shape sandwich structures providing excellent mechanical performance when paired with hyper elastic material such as polyurethane provides high lateral and vertical stiffness, high fatigue resistance, and also high out of plane stiffness.

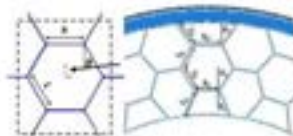


Figure 5: Honeycomb sandwich structure

### Proposed design

The airless tyre design incorporates some of the main features of the make up of other airless tyre designs such as an alloy hub, metal shear band, flexible and deformable polyurethane spokes and a tread, but also includes extra outer spokes and an outer shear band to enhance it's mechanical performance.



Figure 6: Proposed airless tyre design

### Design components

The main features of this design are the two unique spoke configuration which are the sinusoidal wave spokes and also the outer honeycomb spokes which

work in conjunction with each other to provide the necessary stiffness to bear the load of the vehicle but also allow for elasticity to provide shock absorption and smooth driving

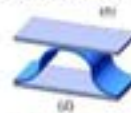


Figure 7: Sinusoidal wave sandwich structure

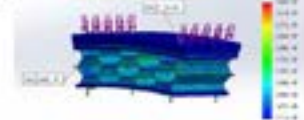


Figure 8: Prepared airless tyre design component

The sinusoidal wave spokes work as a "compression and suspension component, combined with the elastic properties of polyurethane

### Analysis

In order to analyse the mechanical performance of the airless tyre and the sandwich structures Ansys will be used to test to stiffness and flexibility of the honeycomb and sinusoidal wave spokes. These components will be tested separately and a parametric study based on the configuration of the honeycomb will also be carried out. The results will then be compared to previous analysis carried out on other airless tyres and pneumatic tyres to determine their performance and practical applications.



### Conclusions and Future implications

In order for further advancements to made for airless tyres

- Further research and analysis is needed on the application of sandwich structures and sustainable composite materials.

However, recent developments show a promising future for the application of airless tyres which boast many advantages such as

- No flat tyres, lower maintenance costs, the ability for them to be re-treaded, sustainable use and manufacture, one step closer to autonomous driving which shows a bright and impactful future for airless tyres.

### Acknowledgments

I would like to thank my supervisor Dr. Amit Kumar Haldar and my dissertation lecturer Ciodagh Moore for their knowledge and guidance thus far.

### References

Sandberg (2022), Michelin (2022), Hankook (2022), Aboul-Yazid et al., (2015)





## Granule-based material extrusion is comparable to filament-based material extrusion in terms of mechanical performances of printed PLA parts: A comprehensive investigation

Hendal Liu<sup>1</sup>, Ke Gong<sup>1</sup>, Alexander Perzla<sup>1</sup>, Zhi Cao<sup>1</sup>, Roman Dierker<sup>2</sup>, Yuanxun Chen<sup>2</sup>

<sup>1</sup> Polymers, Recycling, Industrial, Sustainability and Manufacturing (PRISM) Athlone Campus, Technological University of the Shannon: Midlands and Midwest, Ireland

<sup>2</sup> Engineering & Informatics Department, Athlone Campus, Technological University of the Shannon: Midlands and Midwest, Ireland

### 1. Introduction

#### Background

Fused filament fabrication (FFF) is the most commonly applied extrusion-based AM method [1]. The drawback for this method is usually in a filament form [2,3]. However, the manufacturing step of filament from granules may result in thermal degradation of PLA under repeated and excessive heating, which decreases the quality of products [4]. In addition, filamentary polymers are difficult to process by fused filament fabrication (FFF) due to a lack of certain viscosity and rigidity [5-14]. To avoid the thermal degradation of the filament production step and breaks the possible feedback mechanism [15-18], the direct printing of the thermoplastic granules has come to spotlight of researchers and manufacturing industries [19]. To date, some examples of fused granule fabrication (FGF) methods have demonstrated the capability of printing using thermoplastic granules [20-23]. In year 2019, another research group concluded that the tensile strength and Young's modulus of FGF samples (49.2 ± 10.7 MPa and 3520 ± 175 MPa, respectively) were lower than those of FFF printed objects (117.7 ± 2.10 MPa and 2300 ± 179 MPa, respectively) because of the low resolution of printing caused by the insufficient melt extrusion flow of FGF method [24]. In 2020, further Alexander and colleagues concluded that average tensile strength of FGF printed specimens was comparable to or a slightly higher than that of FFF samples, which is a very exciting finding and out of the expectations of researchers [4]. However, further Alexander's study did not give further research and analysis on this remarkable conclusion. On the contrary, some other studies, such as from Mc Brien's team [25], suggested the tensile strength of FGF printed dog bones was inferior to that of FFF samples. Apparently, these results above were conflicting, which needs further studies to fill this scientific research gap.

#### Research objectives

- To investigate whether the mechanical performance of FGF printed parts is better, comparable to or lower than that of FFF printed parts.
- To give comprehensive comparison of mechanical performances between the FFF and FGF and give further research and analysis on the results, which were not covered by previous studies.

### 2. Methods

#### Modification of a FFF printer

- A fused granule fabrication (FGF) printer was achieved by replacing the filament melting head of a desktop FFF printer with a single screw extrusion head shown in Figure 1 (a).
- Parts were designed and manufactured for the installation of the new granule-based extruder head.



#### Specimen preparation

- Poly(lactic acid) (PLA) (filament: 1.75mm) filament, PLA granules (1-2.5 mm in length).
- 8 tensile specimens, 5 flexural specimens, 5 Charpy impact specimens and 1 hardness specimen were printed for each printing method.
- G-code were sliced by the same slicer (Creality Slicer 4.8.2) with the same printing parameter setting as shown in table 1.

Table 1 The final 3D printing processes for FFF and FGF printers

| Parameter                  | FFF          | FGF          | Unit    |
|----------------------------|--------------|--------------|---------|
| Nozzle diameter            | 0.4          | 0.4          | mm      |
| Layer height               | 0.2          | 0.2          | mm      |
| Extrusion head temperature | 200          | 200          | °C      |
| Bed temperature            | 30           | 30           | °C      |
| Cooling fan speed          | 30           | 30           | rpm     |
| Filling pattern            | Rectilinear  | Rectilinear  | %       |
| Fill angle (Z-axis)        | 0/90 or 2.40 | 0/90 or 2.40 | °C      |
| Filling density            | 100          | 100          | %       |
| No. of perimeters          | 4            | 4            |         |
| Top solid layers           | 10           | 10           |         |
| Bottom solid layers        | 10           | 10           |         |
| Default support            | 400          | 91           | Support |
| applied support            | 100          | 100          | Support |
| Printing speed             | 60           | 60           | %       |



#### Characterization methods

##### Density test:

- Density of tensile specimens: a digital density balance (Roibatch RD01-01, Germany).

##### Mechanical test:

- Tensile and flexural tests: a 5 kN Lloyd LRX universal tester (Lloyd Instruments Ltd, Bognor Regis, UK).
- Charpy impact tests: an impact tester (Cant 6545, Zwick/Roell, Germany).
- Hardness tests: a shore Durometer (C V Instruments, England) - Shore D scale indicator.

##### Morphology test:

- Surface micrographs: an optical inverted microscope (Olympus CKX41, Japan).
- Cross-section surfaces imaging: a Mira Scanning Electron Microscope (SEM, Tecon Oxford Instruments, UK).

##### GPC test:

- Mw, Mn, Mp, PD and molecular weight distribution: a gel permeation chromatography system.

##### Thermal test:

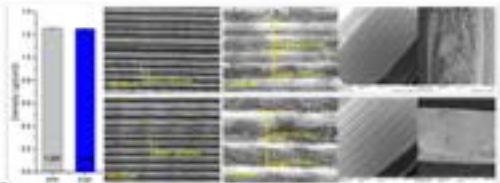
- DSC tests: a Perkin Elmer DSC6.
- Rheology tests: a Discovery Hybrid Rheometer.

### 3. Results and discussion

#### Density consistency

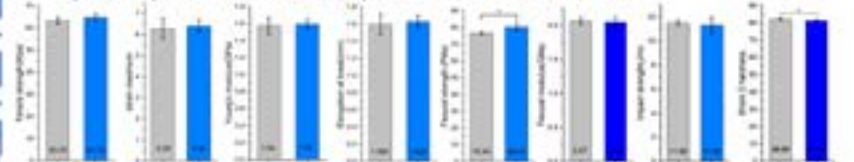
- The comparison of mechanical properties between FFF and FGF printed samples was feasible and comparable: FFF (1.21±0.0051) g/cm<sup>3</sup>, FGF (1.257±0.0041) g/cm<sup>3</sup>, (p=0.058).

- The printing qualities of the specimens of FFF and FGF methods were similar: similar side layer appearance and top surfaces and inner microstructures.



#### Comparison of mechanical performance

The tensile properties of FGF specimens were slightly higher than those of FFF counterparts without significant difference between them. Remarkably, the flexural strength of FGF was around 9% higher than that of FFF ones with a significant difference. Furthermore, the impact strength of FGF samples were comparable to the FFF ones. While, FGF specimens were inferior to FFF ones in terms of hardness.



#### Analyses

##### SEM:

- The surface micrographs of FFF printed tensile, flexural and impact specimens were very similar in terms of void number and size and surface uniformity.

##### DSC:

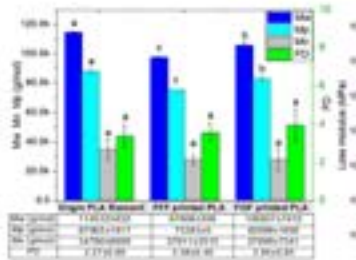
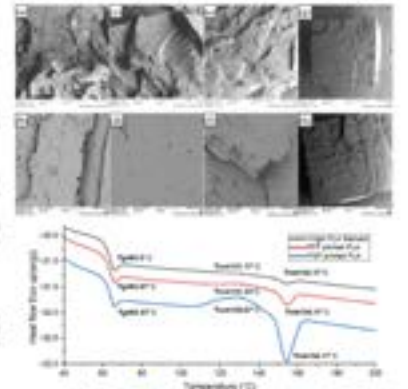
- The T<sub>g</sub>, T<sub>m</sub> and T<sub>cr</sub> values for both FFF and FGF methods were similar. However, the T<sub>g</sub> of PLA sample was higher than the T<sub>g</sub> for FGF ones, suggesting the FGF process had a greater impact on the crystallinity properties of PLA than that of FFF method.

##### GPC:

- Mw, Mn, Mp and PD of FGF samples were higher than that of FFF ones. This important result uncovers the root of some of the unexplained results of mechanical properties presented above.
- Mw, Mn, and Mp of virgin PLA were higher than those of both FGF and FFF printed samples. However, the result for PD is opposite. Suggesting both FFF and FGF processes have thermal degradation functions.

##### Rheology analysis:

- The storage and loss moduli of FGF were slightly higher than those of FFF.
- The average complex viscosity of FGF printed PLA was higher than that of FFF samples across the entire testing angular frequency. Because the Mw and PD values of FGF printed samples were higher than those of FFF samples, the shear function of the type of the FGF extrusion head.



### 4. Conclusions and future directions

- The tensile properties, flexural modulus and impact strength of FGF printed specimens were comparable to or even slightly higher than that of FFF counterparts.
- There was a significant difference in the hardness property between FGF and FFF methods. However, this hardness gap (Shore D 80.64 and 82.28 respectively) can be negligible in real applications.
- The Mw, Mn, Mp, PD, T<sub>g</sub>(%) and complex viscosity of FGF samples were higher than those of FFF counterparts.
- Further investigation on the influence of thermal degradation functions of FGF and FFF extrusion heads on the average molecular weights of printed materials is highly recommended.

### 5. Acknowledge and references

#### Acknowledge

This work has been funded by the European Space Agency (Grant No 400633799-21/9L/CH) and the President's Doctoral Fund from the Athlone Campus, Technological University of the Shannon: Midlands and Midwest.

#### References

[1] N. Jone, Science in three dimensions: The print revolution, Nature, 487 (2012) 22–23. <https://doi.org/10.1038/487022a>.

[2] B.P. Connor, G.P. Maniathan, A.N. Mamed, L.M. Bodovsky, C.M. Roldanillo, D.C. Jordan, J.W. Lipscomb, Making sense of 3-D printing: Choosing a step of additive manufacturing products and services, Addit. Manuf. 1 (2015) 44–56. <https://doi.org/10.1016/j.addma.2015.08.003>.

[3] R. Behrooz, A. Yazici, FDM Printability of PLA-Based Materials: The Key Role of the Rheological Behavior, PCE (2021).

[4] A. Alexander, F.A. Cao Sanchez, H. Boudouard, M. Camargo, J.M. Pizarro, Mechanical Properties of Direct Write Printing of Poly(lactic Acid) with Universal Pellets Extruder: Comparison to Fused Filament Fabrication on Open-Source Desktop Three-Dimensional Printer, 3D Print. Addit. Manuf. 7 (2020) 137–147. <https://doi.org/10.1089/3dp.2019.0191>.





## From Ancient Brew to Modern Marvel: Harnessing Bacterial Nanocellulose for a Green Future

Everton Henrique Da Silva Pereira, Cuneyt Erdinc tas, Margaret Brennan Fournet, Marija Mojicevic  
*Materials Research Institute, Technological University Of The Shannon; Midlands Midwest*

### Intro

Global research is increasingly looking into sustainable and circular ways to deal with plastic issues, involving various fields like materials science, engineering, biotechnology, and enzymatic engineering. The aim is to find eco-friendly solutions for the widespread problem of plastic waste, especially from plastics made from petroleum [1,2].

Bacterial nanocellulose (BNC), sourced from some Kombucha bacteria's as *K. medellinensis*, is seen as a pure and efficient alternative to plastic. However, we face challenges like finding affordable cultivation methods for quicker BNC production and improving its thermoplasticity [3].

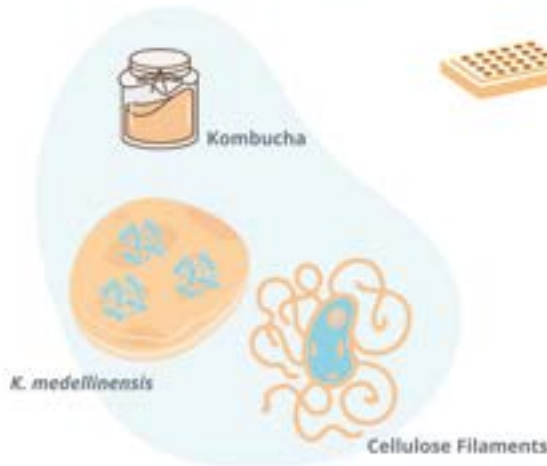


Fig 1. Bacterial nanocellulose production.



Fig 2. Bacterial nanocellulose boosted production by waste-recovered terephthalic acid.

To address this issue, we explored the potential of waste-recovered Terephthalic acid (TPAw) - a byproduct of Polyethylene terephthalate (PET) depolymerization - as an adjunct in the production of bacterial cellulose from *K. medellinensis* ID13488, with the aim of achieving greater plastic circularity.

Such effort not only bring us an alternative for BNC's boot production as a new path to achieve circularity of PET plastics chain. It is summarized on the next infographic.

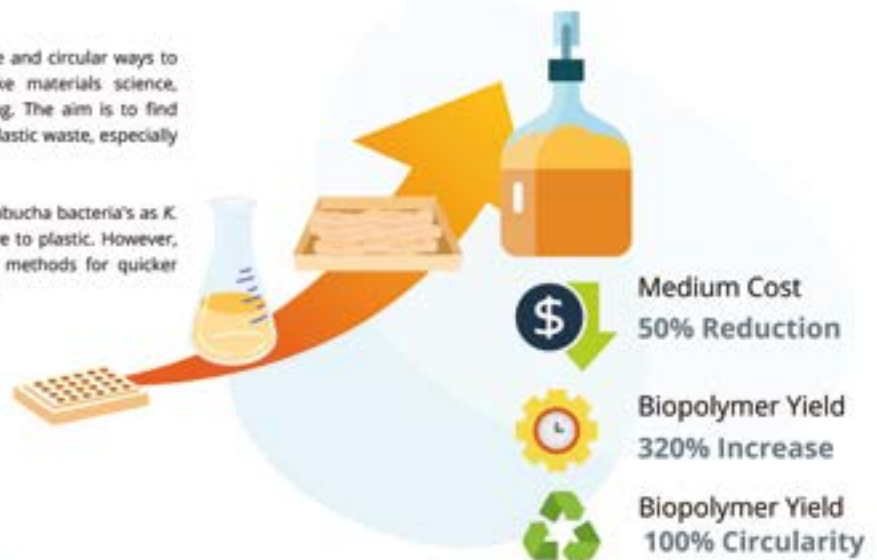


Fig 3. Schematic diagram of bacterial nanocellulose (BNC) production in four different volumes, and main outputs.

So far our research contributed to the following outputs:

1. Using BNC to break down mixed starch materials | **Accepted for publication**
2. Developing specialized techniques for better BNC properties | **Under submission and presented at the FEMS Conference in Microbiology 2022.**
3. Creating new bioactive materials with BNC | **Ongoing**
4. Repurposing plastic waste (terephthalic acid) to boost bacterial nanocellulose production | **Published; scan the QR code to read it.**



### References

1. C. W. Hall, *Journal of Biomedical Materials Research*, 1971, 5, 1–4
2. M. Vallet-Regí, *Frontiers in Materials*, 2021, 9, 864016.
3. F. G. Torres, S. Commeaux and O. P. Troncoso, *Journal of Functional Biomaterials*, 2012, 3, 864–878.

### Hi! It's Henrique

I'm a Brazilian Biotechnologist, MSc. in Biochemistry, beer sommelier, flavors science enthusiast, and passionate learner.

@henrique\_somm [linkedin.com/in/pereiraehs](https://www.linkedin.com/in/pereiraehs)



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement number 872020.





## End-of-Life Routes for Mixed Plastic Waste: What's the Solution?



**Jeovan A. Araujo\***

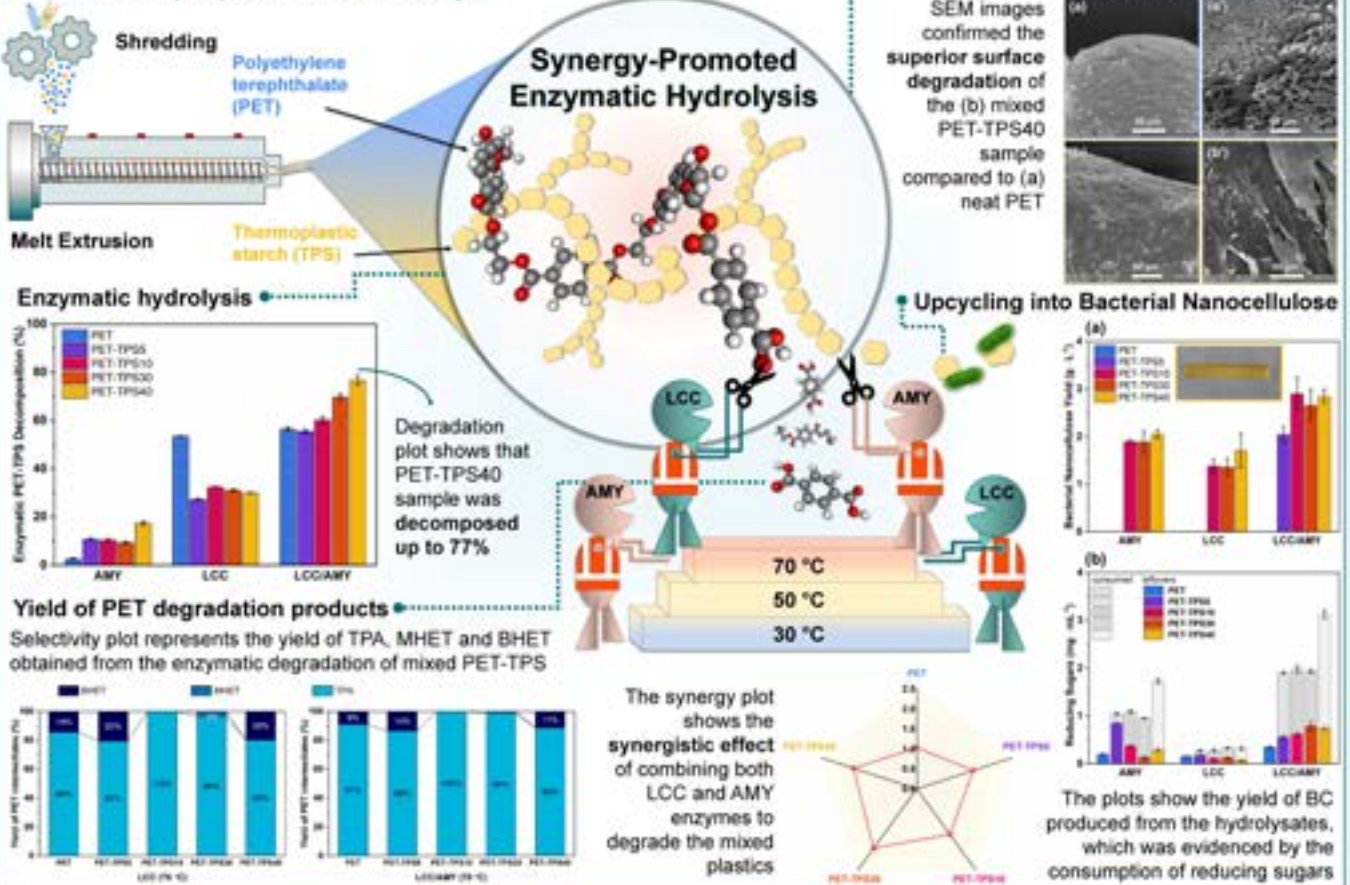
Supervisors: Margaret Brennan Fournet, Marija Mojicevic

Centre for Polymer Sustainability, PRISM Research Institute, N37 HD68 Athlone, Ireland. \*Email: araujojeovan@gmail.com

### 1 Problem and motivation



### 2 Solution proposed in this study



### 3 Conclusions and future work

- Synergistic treatments had a 2.6- and 4.4-fold increase in enzymatic decomposition at 70 °C in four days.
- Sugars and terephthalic acid (TPA) were the main depolymerization building blocks
- This work paves the way for sustainable management routes for challenging mixed recalcitrant plastic and bioplastic waste
- Optimize and scale-up production of BC, and develop similar approaches towards upcycling of other mixed plastics

### Acknowledgements



### References

- Araujo, J.A.; Tassiou, G.; et al. Biotechnological model for ubiquitous mixed petroleum- and bio-based plastics degradation and upcycling into bacterial nanocellulose. *Journal of Cleaner Production* 2024, 442, 141025. <https://doi.org/10.1016/j.jclepro.2024.141025>
- Pantelic, B.; Araujo, J.A.; et al. A novel *Bacillus subtilis* EPM12 with high bio(2) hydroxyethylterephthalate hydrolytic activity efficiently interacts with virgin and mechanically recycled polyethylene terephthalate. *Environmental Technology & Innovation* 2023, 32, 103216. <https://doi.org/10.1016/j.eti.2023.103216>

### Get in touch





## The effect of extreme salinity on the microalgae *Dunaliella salina*

### Abstract



João Rui Tanoeiro, Gustavo Fehrenbach, Rui Pedrosa, Patrick Murray, Yuanyuan Chen

This study looks at how *D. salina* reacts to different salinity levels, focusing on growth, pigment concentration and desalination potential. Out of 21 salinities, 7.5% salinity produced consistently favourable results in cell count, dry biomass, pigment content, and desalination.

### Introduction

- Worldwide demand for freshwater is growing;
- Saltwater desalination has emerged as a crucial method for a sustainable future<sup>1</sup>;
- Halophytic algae (algae that thrive in saline environments) have been used to treat water as a cost-efficient approach<sup>2,3</sup>;
- Dunaliella salina* (halophytic microalgae) shows resilience to high salinity and literature suggests that this alga can reduce salinity of various water sources (such as seawater, sewage and industrial wastewater)<sup>4-6</sup>.

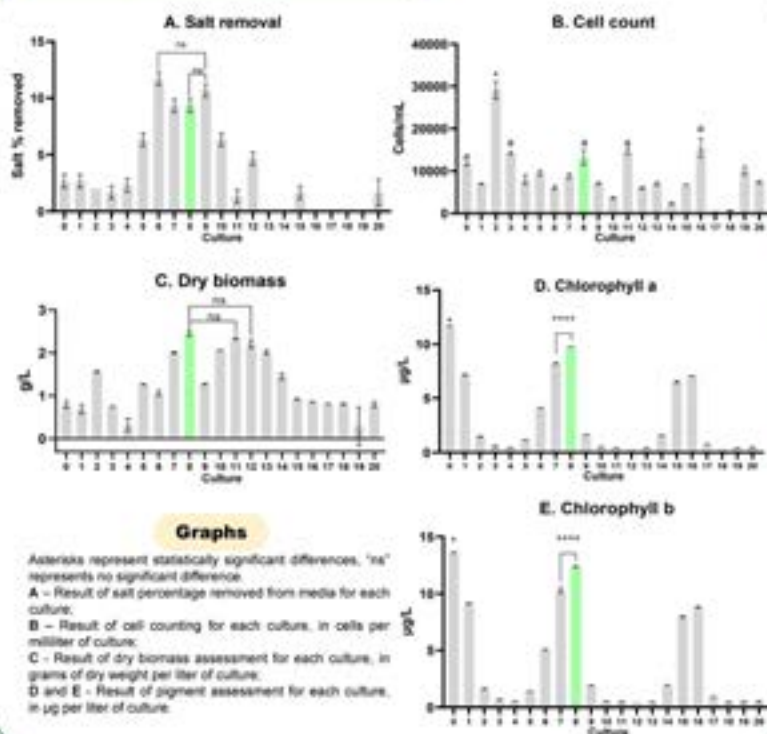
### Methodology



**Table 1.** Initial salinity of each culture.

| Culture    | 0 | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
|------------|---|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Salinity % | 0 | 18 | 27 | 35 | 45 | 51 | 60 | 67 | 75 | 83 | 87 | 96 | 103 | 105 | 110 | 120 | 128 | 134 | 140 | 144 | 165 |

### Results



### Discussion and Conclusion

- The algae survived in all salinities and there was significant desalination in bioreactors 6, 7, 8 and 9.
- Culture 8 (7.5%) had positive results throughout the whole experiment showing high desalination, dry biomass and pigment contents, as well as a moderate cell count.
- These results indicate that halophytic algae should be taken as a strong candidate for desalination of salty waters

### Bibliography





Packaging, Innovation and Product Design

## Increasing Sustainability of Inhalers. Manufacturing and Disposal.



**Student:**  
**Justyna Traore**



### Background:

The recent proposals by the European Commission concerning eco-design, circularity, and sustainability will ultimately impact the pharmaceutical sector, which prioritizes human health and life-saving solutions over the environmental impacts of its medical products. This research aims to help prepare inhaler manufacturers for inevitable changes.

### Methodology:

Mixed Methods Research, involving semi-structured interviews and surveys, supported by observations from an insider working within the industry.

### Companies involved:

TerraCycle®, Teva Pharmaceuticals, Waterford Pharmacies

### Survey for inhaler users:

What is holding customers back from becoming more sustainable with inhalers?



**FILL OUT THE SURVEY**  
 It takes less than 5 min!

### Anticipated Outcomes:

- recognition of manufacturing processes and waste exerting the greatest environmental impact;
- identification of areas in manufacturing with substantial potential for improvement in sustainability and circularity;
- proposal of short-term and long-term solutions, including conversion of waste into secondary raw materials;
- insight into patterns and customer preferences applicable to sustainable product design;
- detection of innovations reshaping the market;
- evaluation of the pilot inhaler recycling program.



Acknowledgements: Micheál Fitzpatrick , Jim Gilchrist





## Biodegradable Blends with Antimicrobial NPs: Characterisation and Mechanical Aspects

Leonardo G. Engler<sup>1,2,3\*</sup>, Janaina S. Crespo<sup>3</sup>, Noel Gately<sup>2</sup>, Ian Major<sup>1</sup>, Declan M. Devine<sup>1</sup>

<sup>1</sup> PRISM Research Institute, Technological University of the Shannon: Midlands Midwest, Athlone, Ireland  
<sup>2</sup> Applied Polymer Technologies, Technological University of the Shannon: Midlands Midwest, Athlone, Ireland  
<sup>3</sup> Postgraduate Program in Engineering and Science of Materials, University of Caxias do Sul, Brazil.  
[\\*A00278634@student.tus.ie](mailto:A00278634@student.tus.ie)

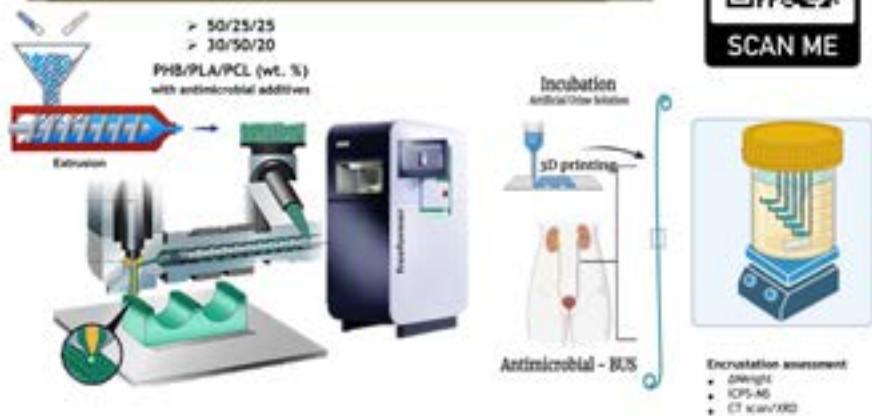
ORCID



### BACKGROUND

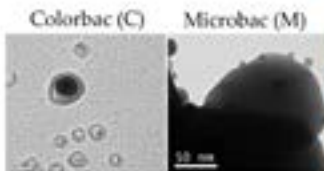
Biomaterials, despite their wide range of applications, may encounter compatibility issues leading to suboptimal mechanical properties and reduced efficiency. Nevertheless, the optimal properties of PLA, including high mechanical strength and low toxicity, it also exhibits drawbacks like low flexibility and brittleness. To address miscibility challenges among polymers with different solubilities, researchers commonly use compatibilizers and plasticizers. In the current study, ZnO/Ag and SiO<sub>2</sub>/Ag NPs antimicrobials were employed to enhance miscibility among PLA, PHB, and PCL, aiming to improve the mechanical properties and create a microbial-resistant material suitable for medical device applications.

### METHODOLOGY



### RESULTS & DISCUSSION

### FUTURE WORK

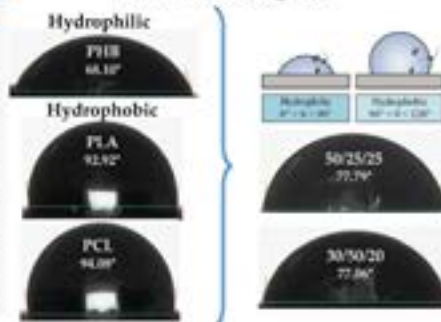


Particle size (TEM):  
• SiO<sub>2</sub>/Ag forms core-shell structures  
• ZnO nanorods surrounded by Ag NPs

ICP-MS:  
• Microbac: Ag 0.024%  
• Colorbac: Ag 1.560%

| Sample        | Contact Angle (°) |
|---------------|-------------------|
| PHB           | 68.68 ± 3.26      |
| PLA           | 91.28 ± 3.12      |
| PCL           | 93.48 ± 4.08      |
| 50/25/25      | 76.59 ± 4.15      |
| 30/25/25 M0.5 | 75.53 ± 3.50      |
| 30/25/25 M1.0 | 68.51 ± 4.22      |
| 30/25/25 C0.5 | 74.81 ± 5.11      |
| 30/25/25 C1.0 | 72.50 ± 5.76      |
| 30/50/20      | 76.45 ± 4.21      |
| 30/50/20 M0.5 | 70.60 ± 3.74      |
| 30/50/20 M1.0 | 66.32 ± 1.86      |
| 30/50/20 C0.5 | 68.00 ± 3.70      |
| 30/50/20 C1.0 | 70.23 ± 1.95      |

### Water Contact Angle (°)



- ✓ Improve materials' flexibility with compatibilizers
- ✓ Freeformer 300-3X 3D Printing
- ✓ Ureteral stent prototypes
- Encrustation assessment

### ACKNOWLEDGEMENTS

This study work has emanated from research conducted with the financial support of the Enterprise Ireland under the Capital Call 2019 Grant No CE 20190068 and Applied Polymer Technology Gateway Project No TG-2017-1014.

### REFERENCES



| Particle size (nm)   |               |
|----------------------|---------------|
| Colorbac             |               |
| Ag NPs               | 16.3 ± 7.6    |
| ZnO NPs              | 245.0 ± 127.2 |
| Microbac             |               |
| Ag NPs               | 13.1 ± 5.3    |
| SiO <sub>2</sub> NPs | 22.2 ± 6.7    |

➤ The manufactured material showed improved flexibility and toughness, as observed by the formation of core-shell structures, in which a soft material (PCL) is encapsulated by a brittle one (PHB) in a polymeric matrix (PLA), this phenomenon happens due to the reduced interfacial tension between each component which is caused by the addition of the antimicrobials which act as a compatibilizer for the blends, therefore promoting the miscibility between the materials. The blends also showed hydrophilic properties, and the addition of antimicrobials enhanced the materials water affinity, which is ideal for ureteral stent applications.





## Establishing a more sustainable festival calendar – Co-creation at ‘dark tourism festivals’

(Mrs. Luisa Golz, Department of Hospitality, Tourism and Leisure Studies)



ORCID ID

### Research background – what are dark tourism festivals?

This research develops new theory extending the current boundaries of dark tourism and festival research. Dark tourism festivals describe a touristic activity which celebrates dark histories, the Gothic and the macabre.

Generally, dark tourism sites and activities can be plotted along a continuum (see below), ranging from “darkest” to “lightest” (Stone, 2006).



My area of research is concerned with festival activities, located on the “lighter” end of the dark tourism spectrum. These festivals are a celebration of culture, utilising the macabre and dark heritage as entertainment themes, providing ‘fearful fun’ (Zhang et al., 2022).

### Research background – co-creation of festival experience

In a general context, co-creation is achieved through participation in memorable experiences. When festival participants are encouraged to *participate* rather than *look*, meaningful and personal experiences are created (Gretzel, Fesenmaier and O’Leary., 2006; Campos et al., 2018). Participants do not simply experience the festival, they can also become an attraction in themselves (Simons, 2020).

### Data collection method:

Data collection from festival participants and festival management takes place at two main sites:

- 1) the Whitby Goth Weekend (UK)
- 2) the Bram Stoker Festival (Dublin)



Two main methodological tools were utilised:

- 1) Participant observation (October 2021 – November 2023)
- 2) Semi-structured interviews with professionals in the festival industry; festival organisers and promoters; festival participants (February 2021 – November 2023)

### The two case studies

#### Bram Stoker Festival:

- established to increase awareness of the connection between ‘Dracula’ author Bram Stoker and his birth place Dublin



#### Whitby Goth Weekend:

- an alternative music and Goth festival with high levels of participant involvement



### Findings – co-creation at dark tourism festival

#### Co-creation of in-person experience



#### Co-creation of online content

| Whitby Goth Weekend   | Bram Stoker Festival   |
|---|--|
| Online content is provided by <b>both fans and organisers</b> and participants voluntarily act as ‘unpaid influencers’, helping to create a strong festival brand   | Online content is provided by <b>organisers</b> who are hired to attract more visitors, seeking to create a stronger festival brand  |
| <ul style="list-style-type: none"> <li>- Organisers post content on <b>Facebook</b> pages and groups; Participants actively post content in <b>Facebook groups</b>, high levels of co-created content</li> <li>- Varied and often personal content is posted by both organisers and participants</li> <li>- Highly visual content with lots of <b>images</b> provided mainly by participants</li> </ul> | <ul style="list-style-type: none"> <li>- Organisers post content on official festival <b>Facebook</b> page; Participants like, share and comment, but overall low levels of co-created content</li> <li>- Organisers mainly post informational content such as program details, promoting events</li> <li>- Every post has <b>image</b> and/or the logo of the festival attached provided by the organisers</li> </ul> |
| High levels of reactions with participants actively commenting on posts   | Muted reactions with some exceptions, i.e. when events have sold out early   |
| Fragmented provision of event information supplied by a multi-layered team  | Straight-forward provision of event information supplied by one team   |

➔ Co-creation in-person and online promotes dark tourism festivals

### Research impacts - dark tourism festival benefits

1. With the help of these festivals, lesser-known regions and towns can be promoted.
2. These festivals tend to attract a culturally curious and socially minded visitor segment.
3. Otherwise perhaps forgotten cultural treasures are celebrated, such as Bram Stoker and his creation ‘Dracula’.
4. The traditional festival season is stretched outside of the summer months and into the off-season, alleviating capacity pressures.

↓  
Dark tourism festivals help create a more sustainable festival calendar for the future

This work is funded by the Presidents Doctoral Scholarship and my special thanks goes to Dr Tony Johnston for his ongoing support and encouragement









## FROM SEA TO PHARMACY

A sustainable valorization of the red seaweed *Gelidium corneum*

Margarida Matias K00278389

Supervisors: PhD Patrick Murray <sup>a</sup>, PhD Alice Martins <sup>b</sup>, PhD Susete Pinteus <sup>b</sup>

<sup>a</sup> LIFE-Health and Bioscience Research Institute, Technological University of Shannon, Moylish Park, V94 D9YF Limerick, Ireland  
<sup>b</sup> MARE Marine and Environmental Sciences Centre and ARNET-Aquatic Research Network, Escola Superior de Tecnologia e Tecnologia do Mar, Polytechnic University of Leiria, 2520-600 Peniche, Portugal

### INTRODUCTION

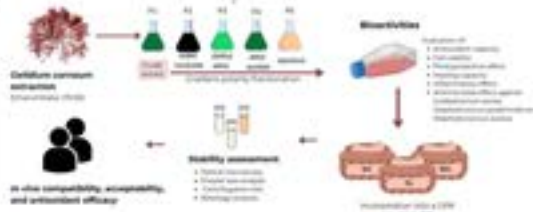
*Gelidium corneum* is a red seaweed exclusively harvested manually by divers along the S. Martinho do Porto shore (Portugal). Despite its scarcity, it is exclusively utilized for agar extraction <sup>[1]</sup>. After agar extraction, the remaining biomass is typically discarded in agricultural fields.

Nevertheless, *Gelidium* species contain valuable compounds with significant biotechnological potential <sup>[2]</sup>, suggesting an opportunity to enhance the overall value of this marine resource, which allied with the potential of its discarded biomass rich in cellulose, makes it a prime candidate for the development of different products.

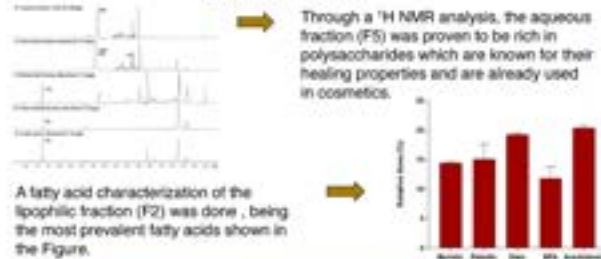
Hence, the objective of this study is to fully tap into the potential of this seaweed species and strive for the establishment of a circular and sustainable industrial process for its utilization in cosmetics.

### RESULTS

#### Overall Scheme of the study

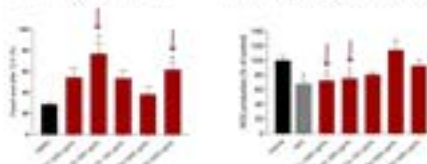


#### Chemical Profile



#### Tissue Culture Testing

##### Healing capacity      Photoprotective activity



The \* symbolizes statistical differences in relation to the vehicle

F2 displayed a great potential in both healing and photoprotective assays, as well as in the antimicrobial assays, however it also has a limited yield.

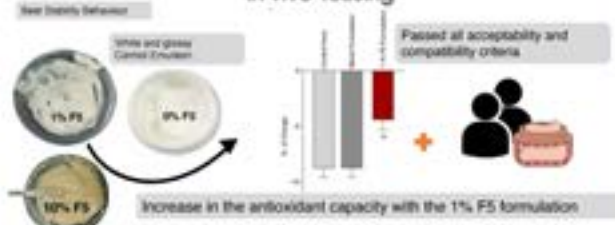
TABLE 1. Elemental analysis of Gelidium corneum biomass (SEM µg/mg)

| Element | Sample | Sample (SEM µg/mg)   | Reference (SEM µg/mg) |
|---------|--------|----------------------|-----------------------|
| C       | F2     | 50.00 (4.75 - 47.00) | 56.50 (7.27 - 47.00)  |
|         | F5     | 50.00 (4.75 - 47.00) | 57.00 (4.75 - 47.00)  |
| H       | F2     | 6.00 (0.50 - 0.70)   | 6.00 (0.50 - 0.70)    |
|         | F5     | 6.00 (0.50 - 0.70)   | 6.00 (0.50 - 0.70)    |

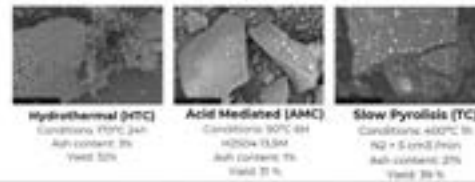
\* Data related to percentage regarding the maximum reference for each.

Further chemical analysis and comparison of the chemical profile over time might contribute to a better understanding of this extract's bioactivities.

#### In vivo Testing



#### Post-Extraction Biomass Valorisation (SEM)



In the future, activated biochar will be developed to increase pore surface area

### CONCLUSIONS

- The incorporation of *G. corneum* aqueous extract (1%) into a formulation improved its antioxidant capacity.
- No adverse effects were observed in human volunteers.
- Post-extracted biomass is suitable for multiple biochar methodologies.

### REFERENCES

1. Gaspar, R., Pereira, L., & Sousa-Pinto, I. (2016). The seaweed resources of Portugal. *Substancia Verde*, 6(2), 489-525.
2. Muga, T., & Fernandes, I. B. (2022). The Red Seaweed Giant *Gelidium* (*Gelidium corneum*) for New Bio-Based Materials in a Circular Economy Framework. *Earth*, 3(2), 789-813.

### PUBLICATION

New Insights into the Dermocosmetic Potential of the Red Seaweed *Gelidium corneum*





Title: Characterization and Exploration of the Anti-Obesity Properties of Microalgae Species Isolated from Irish water.

Author: Mehdi Amiri, A00316234

Supervisors: Dr Evert Fuenmayor, Dr Emma J. Murphy & Dr Noel Gately

## Research Question

*Are there bioactive compounds within microalgae species isolated from Irish water that exhibit anti-obesity properties?*

## Introduction

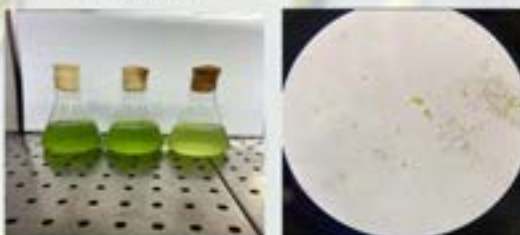
Ireland has the second highest obesity rate in Europe (1)

Obesity has emerged as a global health concern, contributing significantly to the prevalence of various metabolic disorders and chronic diseases. As the quest for effective and sustainable approaches to combat obesity continues, attention has turned towards the exploration of natural resources with potential anti-obesity properties. Microalgae, abundant in marine environments, have garnered significant interest for their diverse biochemical compositions and therapeutic potentials (2). In this context, this research endeavours to characterize bioactives isolated from Irish microalgae species and delve into its anti-obesity effects.

We aim to contribute valuable insights to the development of novel strategies for obesity management.

## Summary of Work to Date

- Specialised training on Analytical equipment to characterise identified bioactives
- Culturing of microalgae species for screening of bioactives
- Establishment of enzymatic assays to determine biological activity.

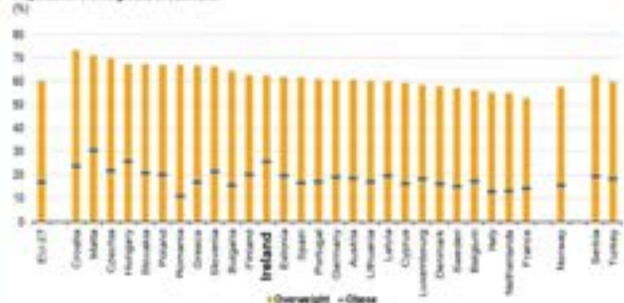


With the permission of Katie Shiels and Kornelia Przychodnia

## Future Work (Timeline)



Proportion of overweight and of obese 2019 (%)



The highest proportions of women considered to be obese were recorded in Estonia (23.6 %) Latvia (25.7 %), **Ireland (26.0 %)** and Malta (26.7 %), while for obese men the highest shares were found in Croatia (23.7 %), **Ireland (25.7 %)**, Hungary (25.8 %) and Malta (30.6 %) (3)

## REFERENCES:

- (1) Feeney, N. (2023, June 8). Survey reveals Ireland has second highest rate of obesity in EU - CCH. CCH. <https://www.contemporaryhealth.co.uk/obesity-in-europe/survey-reveals-ireland-has-second-highest-rate-of-obesity>
- (2) Gómez-Zorba, S., Trepiana, J., González-Arce, M., Aguirre, L., Mitoš-Laskibar, I., González, M., & Portillo, M. P. (2019). Antibesity effects of microalgae. *International Journal of Molecular Sciences*, 21(1), 41.
- (3) Overweight and obesity - BMI statistics. (2018). Eurostat. [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Overweight\\_and\\_obesity\\_-\\_BMI\\_statistics](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Overweight_and_obesity_-_BMI_statistics)





TUS

Technological University of the Shannon  
Midlands Midwest  
Oifrigíúil Techno-eochtúchá na Siarainne  
Lár The farthar Láir

# Aligning personal values in the workplace: A cross-cultural mixed method study

Mohd Sufino Zuhaily bin Mohd Sufian, Ph.D Candidate  
Supervised by Jason Palfreman



## Introduction

The importance of job fit for individual well-being is highlighted by its alignment with qualifications, needs, and career goals. Personal values serve as a perceptual filter, influencing how individuals interpret organizational supplies, including financial, physical, psychological, task, and interpersonal rewards. The interplay between individuals and organizations results in organizational fit, impacting motivation, engagement, and commitment.

Despite its benefits, the interaction of personal values in organizations is under-researched, creating a gap in understanding how personal values shape the alignment between organizational offerings and individual values. Organizations stand to benefit by customizing policies and cultures to match personal values, creating a conducive environment. However, cultural dimensions, such as power distance and individualism, must be considered in this matching process, as values vary across cultures. In conclusion, integrating personal values into organizational strategies enhances job fit, contributing to individual well-being and organizational success.

(Joharizal et al. 2021, van Vianen, 2018, Treviño, et al. 2020)

## Aims

This research aims to develop a conceptual model merging personal values theory with person-organization (P-O) fit. The model, adapted from the Strategic Choice Under Conditions of Bounded Reality Model, intends to investigate the substantial influence of personal values and cultural dimensions as perceptual filters on P-O fit outcomes and behavior. Employing a pragmatic worldview, the study seeks to validate personal values' outcomes using both positivist and interpretivist approaches.

It aims to uncover thematic connections between fit or misfit characteristics, individuals' personal values in an organization, and the meaning extracted from outcomes and behaviors. Additionally, the research explores the cross-cultural significance of personal values and P-O fit, assessing the consistency of data collected beyond self-reported questionnaires.

## Methodology

This study utilizes an explanatory sequential mixed-method design with two stages of data collection. In Stage 1, a quantitative approach captures a snapshot of participant experiences, addressing fit or misfit states. The sampling technique combines snowballing and convenient sampling, leveraging snowballing to reach specific groups inaccessible through traditional methods and convenient sampling for accessibility. This dual approach mitigates logistical challenges across regions. The participant requirement for this stage will be workers currently working in Ireland or Malaysia across multiple industries.

In Stage 2, a qualitative method for thematic analysis is employed, utilizing purposive sampling based on Stage 1 questionnaire responses. This sequential design aims to enhance understanding by first exploring quantitative data and then delving deeper into participant experiences. The combination of sampling methods in Stage 1 ensures a comprehensive representation of participants from diverse backgrounds, contributing to the study's cross-regional validity and providing valuable insights into the thematic connections between personal values and organizational fit.

### Process



# Aligning Personal Values in The Workplace: A Cross-cultural Mixed Method Study

## Stage 1: Results

| Matched         | Not matched            |
|-----------------|------------------------|
| Construction    | Agriculture (Malaysia) |
| Insurance       | Energy (Malaysia)      |
| E-Commerce      | Education              |
| Manufacturing   | Food (Ireland)         |
| Education       | Oil and Gas (Malaysia) |
| Life            | Trade (Malaysia)       |
| Finance         | Technology (Malaysia)  |
| Retail          | Engineering (Malaysia) |
| Healthcare      |                        |
| Technology      |                        |
| Health/Wellness |                        |

Table 1: Matched and non-matched industries between Ireland and Malaysia.

The survey on aligning personal values in the workplace included 55 Malaysians and 37 Irish workers from a diverse sample spanning 21 industries across both countries—18 in Ireland and 18 in Malaysia.



Figure 1: Personal values priority between Ireland and Malaysia.

In Ireland, 41% prioritize self-transcendence, compared to only 4% in Malaysia. Malaysians prioritize conservation at 45%, while in Ireland it's 5%. Irish participants focus on self-enhancement (13%), a category not prioritized by Malaysians. Both countries share a high value for openness to change, with 51% in Malaysia and 41% in Ireland. These variations highlight distinct cultural differences, emphasizing the importance of understanding societal norms and individual values in diverse regions.

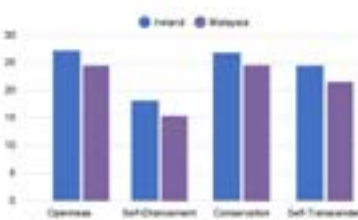


Figure 2: Average score each values between Ireland and Malaysia.

Workers' average scores in Ireland and Malaysia exhibit minimal differences, showing a similar spread in higher-order personal values orientation. Although priorities differ, participants in both regions commonly have dominant scores across multiple areas, with slight variations in each higher-order personal values orientation. This suggests nuanced distinctions in value preferences among workers in Ireland and Malaysia, reinforcing the importance of recognizing and addressing these subtle variations in a cross-cultural context.

| Fit/Misfit Range to Perceived | Fit | Misfit | Counts | % of Total |
|-------------------------------|-----|--------|--------|------------|
| Low misfit                    | Fit | Misfit | 8      | 9.0%       |
|                               | Fit | Misfit | 2      | 2.2%       |
|                               | Fit | Misfit | 30     | 33.7%      |
|                               | Fit | Misfit | 3      | 3.4%       |
| Moderate misfit               | Fit | Misfit | 18     | 20.2%      |
|                               | Fit | Misfit | 6      | 6.6%       |
| Highly misfit                 | Fit | Misfit | 5      | 5.6%       |
|                               | Fit | Misfit | 8      | 9.0%       |
| Severely misfit               | Fit | Misfit | 5      | 5.6%       |
|                               | Fit | Misfit | 2      | 2.2%       |

Table 2: Matching perceived fit/misfit to fit/misfit range.

A total of 66 perceived fits and 23 perceived misfits were sampled, comprising 40 perceived fits and 13 perceived misfits from Malaysia and 26 perceived fits and 10 perceived misfits from Ireland. Interestingly, only 8 participants exhibited a range of fit and perceived fit alignment, while 58 participants did not, with their states ranging from low misfit to severe misfit. This highlights diverse perceptions of alignment in the sampled participants.

## References

Schwartz, S. H., & Carruth, J. (2021). Measuring the Purified Theory of Individual Values in 48 Cultural Groups: Psychometrics of the Revised Portrait Value Questionnaire Assessment. *11(2)1912-1927*.

van Vianen, A. E. M. (2018). Person-Environment Fit: A Review of Its Basic Tenets. *Annual Review of Organizational Psychology and Organizational Behavior*, 9(1), 75-103.

Treviño, L., Egri, C., Ralston, D., Narasimha, L., Li, Y., León-Gómez, F., Gerstka, M., & Furner, D. (2020). A Cross-Cultural Examination of Person-Organization Fit: Is P-O Fit Congruent with or Contingent on Societal Values? *Management International Review*, 60.

Venkatiah, V., Winkler, J. B., Barak, K. M., & Wilkenborg, J. D. (2017). Person-Organization and Person-Job Fit Perceptions of New IT Employees Work Outcomes and Gender Differences. *MIS Quarterly*, 41(2), 525-558.

Oh, S. H. (2013). Do collectivists conform more than individualists? Cross-cultural differences in compliance and internalization. *Social Behavior and Personality: An International Journal*, 41(5), 561-584.

## Conclusions

In summary, Stage 1 sheds light on distinct personal values orientation (PVO) priorities, especially in conservation, where elevated scores suggest a preference for collective harmony, diverging from individualistic cultural norms. Notably, a discrepancy surfaces in reported perceived fit and misfit, potentially rooted in a social desirability bias favoring job fit expectations over genuine self-assessment.

However, drawing comprehensive conclusions requires further exploration in Stage 2. Despite PVO differences, variations in average scores for openness, self-enhancement, conservation, and self-transcendence emerge. To delve deeper into participants' perspectives and clarify the reasons behind perceived fit and fit scores from the questionnaire, in-depth interviews are necessary. This subsequent investigation seeks to provide an understanding of participant behavior, aiming to unveil the intricacies underlying their responses during the survey and contributing to a more comprehensive analysis of the observed patterns.

(Oh, 2013, Venkatiah et al. 2017)



TUS

Technological University of the Shannon  
Midlands Midwest  
Oifrigíúil Techno-eochtúchá na Siarainne  
Lár The farthar Láir

Department of Hospitality, Tourism,  
and Leisure Studies,  
Faculty of Business and Hospitality,  
Technological University of the Shannon,  
Midlands Midwest  
Ireland, Ireland



SCAN ME





## An Assessment of Testing Pooled Samples for the Presence of Carbapenemase-Producing Enterobacterales, (CPE) using Different Testing Methods; Molecular and Culture

**Student:** Trish Doyle

**Supervisor:** Kevin Farrell

### Research Questions:

1. What are the outcomes of pooling samples for CPE screening using molecular testing versus established culture methods?
2. Would the pooling of samples for CPE screening prove beneficial for the Irish population?

### Aim/ Objectives:

1. To determine a true negative result when samples are pooled for CPE screening.
2. To determine the benefits for Irish patients when samples are pooled for CPE screening.

### Introduction

CPE are Superbugs resistant to most antibiotics. CPE screening is an important tool for controlling the spread of antibiotic-resistant bacteria. Current culture methods are inexpensive but slow compared to molecular testing which are quicker but more expensive. Could costs of molecular testing be reduced? It is proposed that an assessment of CPE screening using pooled samples is a worthwhile project. The two test methods will be assessed to determine the most efficient method for CPE screening with the optimal number of samples to pool determined to negate false negative results or the need for repeat testing. This research of interest because CPE screening is performed on admissions from the Emergency Department within the testing Hospital, for ICU admissions and elective surgeries. In addition, prevalence in the Irish population has been reported as low at <2% (Cafferkey et al 2019).

### Potential Findings:

This study will establish the most efficient method for CPE screening and the optimal number of rectal swabs that can be pooled to maximise resources and decrease test turnaround times (TATs).

### Method:

The study method is of a quantitative experimental design using bacterial isolates and simulated specimens for CPE investigation. There will be two parts to the study Part A will include known negative and positive samples to use in a comparison investigation, established cultured methods versus molecular test methods. Part B will randomly and blindly test pooled samples based on findings in Part A. Accuracy, precision, specificity and sensitivity will be determined for each test method. Analysis of the data collected will determine the optimal number of samples to pool for batch testing; aiming for zero to minimal repeat testing and zero to minimum false negatives. It is believed this cause-and-effect approach where pooled sample numbers are varied and results investigated will answer Research Questions.

### Key Literature:

The idea of pooling samples for screening purposes has been described formerly in the 1940s for syphilis testing (Dorfman, 1943) and most recently for Covid 19 (Mahmoud et Al; 2021). The latter studies have reported decreased reporting times and efficient use of resources, staff, consumables, waste production and time. It is recognised any investigation involving the pooling of samples should first involve the establishment of the optimal pooled sample number for the test proposed. The batch of pooled samples, Williams, 2010, suggests should be sufficient to reduce test number while being cost effective, but, not so large as to increase the likelihood of a positive result, necessitating repeat sampling. Williams, 2010, further indicated that where the prevalence of positivity is <30% pooling has little value but a prevalence of 1% to 30% shows a pool size of 4 samples to be near optimal, with prevalence below 1% indicating considerable gains from pooling. In addition, Hwang, 1976, suggests the sensitivity of the sample number pooled must be considered; it may be decreased due to a diluting effect if the pool size is too large, leading to false negatives. The prevalence of CPE in the Irish population is low at <2% (Cafferkey et al 2019). Pooling samples for CPE screening with such low current prevalence statistics could lead to savings on consumable use and to decreased TATs for patient testing.

The infographic is titled "?To Pool or NOT to Pool that is the Question?". It features a green cartoon bacterium character. The content is divided into four sections:
 

- 01 CONTEXT:** Carbapenemase-Producing Enterobacterales (CPE) are pathogens associated with healthcare.
- 02 AIM:** To determine the impact of pooling rectal swabs for Carbapenemase-Producing Enterobacterales (CPE) using various pool sizes relative to using either established culture methods or TATs.
- 03 NEEDS:** Expensive, slow, labour-intensive methods to detect CPE. The optimal number of samples to pool will be determined to negate false negative results or the need for repeat testing.
- 04 Potential Outcome:** This study will establish the most efficient method for CPE screening and the optimal number of samples to pool to maximise resources and decrease TATs.

 The infographic also includes a diagram showing how pooling 4 samples into one pool can reduce the number of tests from 4 to 1, and a small illustration of a hospital ward.

### References:

Cafferkey, J., Stubb, M., Finn, C., Dunlop, S., Fitzpatrick, M., Burns, K., O'Connell, K., Fitzpatrick, P., Smith, E. and Humphreys, H. (2019). Value of a hospital-wide point prevalence survey of carbapenemase-producing Enterobacterales – low-level prevalence confirmed. *Journal of Hospital Infection*, Vol 93, No. 2, pp 191-194. Available at: <https://www.sciencedirect.com/science/article/pii/S0950423018317661> Accessed 23rd September 2023.

Dorfman, R. (1943). The detection of defective members of large populations. *The Annals of Mathematical Statistics*, Vol 35, pp 433-440. Available at: <https://www.jstor.org/stable/2333920?seq=1&fromOpenFullTextOnJSTORFullTextPage> Accessed 23rd September 2023.

Hwang, F.K. (1976). Group Testing with a Dilution Effect. *Biometrics*, Vol 32, 671-680. Published by Oxford University Press. Available at: <https://doi.org/10.1093/biomet/32.3.671>

Mahmoud, SA., Ibrahim, E., Thakir, S., Tabbal, JB., Rafeek, P., Ghanem, S., and Zaher, WS. (2021). Evaluation of pooling of samples for testing SARS-CoV-2 for mass screening of COVID-19. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7610579/> Accessed 23rd November 2023.

Williams, B.S. (2010). Optimal pooling strategies for laboratory testing. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2917967/> Accessed 23 March 2023.





## An Investigation into the Effect of Repeated Use on the Appearance and Properties of Plastic Food Packaging Materials

Ronan Farrell <sup>1,2</sup>, Yvonne J. Cortese <sup>2</sup>, Declan M. Devine <sup>2</sup> and Romina Pezzoli <sup>1,2</sup>

1: Applied Polymer Technologies Gateway, Technological University of the Shannon, Midlands Midwest, Athlone, Ireland

2: PRISM Research Institute, Technological University of the Shannon, Midlands Midwest, Athlone, Ireland

### INTRODUCTION

In recent years, reusable packaging schemes have been receiving an increasing amount of interest, with many companies and small businesses making efforts to redesign their business models and transition from single-use packaging to reusable packaging.<sup>1</sup> However, one aspect not often considered during this transition is the influence of repeated use on the functionality of the packaging material. Throughout its lifetime, reusable packaging can be subjected to numerous cycles of microbe contamination and rigorous washing conditions and to date, only a small number of studies are dedicated to investigating how these conditions affect a material's properties.<sup>2-3</sup> This study aims to investigate the influence of repeated use on the appearance and intrinsic properties of various plastic packaging materials with the potential to be used in reusable food packaging applications.

### METHODOLOGY



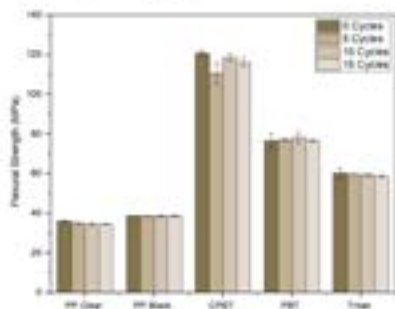
Figure 1 | Materials reusability study methodology.

### RESULTS

#### Mechanical Performance:

Flexural testing revealed minimal changes in the flexural strength of the materials after 5, 10 and 15 cycles of washing and contamination. The largest change of a reduction in 10 MPa was observed for CPET.

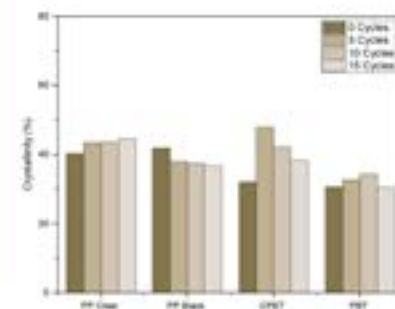
This suggests that repeated use does not greatly impact the mechanical performance of plastic packaging materials.



#### Polymer Crystallinity:

Small increases in crystallinity of 2 - 4% were recorded for PP clear and PBT, while larger increases of 6 - 15% were recorded for CPET.

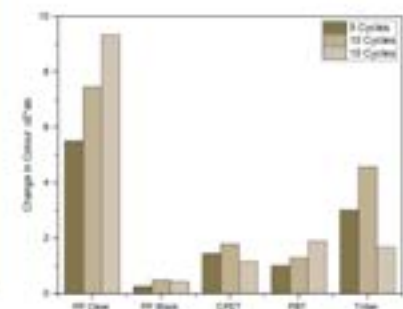
The reason for these increases in crystallinity is probably due to the hot environment of the microwave/dishwasher, which can cause the rearrangement of polymer chains and molecular relaxation facilitating crystallisation.



#### Colour Changes:

Colourimetry results show that PP Clear has poor stain resistance to tomato sauce, with  $\Delta E^*ab$  values increasing with cycle number.

This trend is most likely due to the enhanced absorption of the red pigment lycopene found in tomatoes resulting from the similarity in the chemical structure of PP and this pigment.



### CONCLUSION

This study investigated the influence of reuse on the appearance and intrinsic properties of plastic packaging materials. Mechanical testing showed that repeated use resulted in minimal changes in mechanical properties. DSC analysis revealed that washing conditions can alter the material's microstructure. Finally, colourimetry showed that PP Clear had the worst stain resistance and a possible affinity for the pigment lycopene in tomatoes. This finding highlights the need for further research in polymer staining behaviour and the development of surface protection strategies.

### REFERENCES

- [1] S. C. Greenwood et al., "Many Happy Returns: Combining insights from the environmental and behavioral sciences to understand what is required to make reusable packaging mainstream," *Sustain. Prod. Consumer*, vol. 27, pp. 1688-1702, Jul. 2021, doi:10.1016/j.spc.2021.03.022.
- [2] Doineau E, Rol E, Gontard N, Angellier-Coussy H. Physical-Chemical and Structural Stability of Poly(3HB-co-3HV)/ligno-cellulosic Fibre-Based Biocomposites over Successive Dishwashing Cycles. *Membranes*. 2022;12(2):127. doi:10.3390/membranes12020127.
- [3] Nahar S, Sian M, Larder R, Hatton FL, Woolley E. Challenges Associated with Cleaning Plastic Food Packaging for Reuse. *Waste*. 2022;1(1):21-39. doi:10.3390/waste1010003.





## Investigating the Effects of Glyphosate Exposure on Survival, Reproduction and Development in *Drosophila melanogaster*.

Tolulope Olusegun Ajayi, AnnMary Jacob, Dr. Cairtriona M. Collins.  
Department of Bioveterinary and Microbial Sciences



### Abstract

This project investigates how glyphosate, a widely used pesticide, affects insect survival, development, and reproduction using fruit flies (*D. melanogaster*) as a model. Lethal concentrations (LC50) of two glyphosate formulations are already determined. Moreover, preliminary results have also shown that glyphosate reduces the development and fertility of *Drosophila*. Future experiments will focus on the exploration of the cellular and molecular mechanisms using imaging techniques to assess reproductive tissues. Furthermore, bioaccumulation will be analysed to assess glyphosate buildup in larvae and adults to link observed effects to exposure levels. This study aims to validate both field and specific studies on glyphosate's impact on insects.

### Introduction

1. Food insecurity drives increased pesticide use, leading to declining insect biodiversity.
2. Glyphosate, a popular pesticide, is shown to harm bumblebees (1, 2), fruit flies (3, 4), and potentially other insects (5).
3. Studies on fruit flies (*Drosophila*) provide valuable insights due to their physiological similarities to other insects (6).
4. Gallup and Roundup are common commercial formulations of glyphosate.
5. The concentration of glyphosate in both formulations is 360g/L.
6. These findings could indicate broader impacts of glyphosate exposure on non-target organisms beyond studied species.

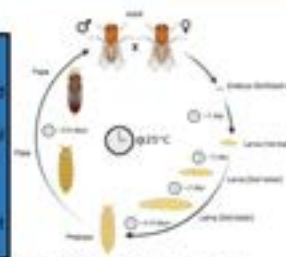


Fig 1: *Drosophila* Lifecycle by (7)



Fig 2: Showing Pictures of Gallup (left) and Roundup (right) Commercial Formulations (8,9).



Fig 3: Molecular Structure of Glyphosate (10).

### Summary of Findings

A) The LC50 values for glyphosate containing formulations Roundup and Gallup were identified as 6.43 mg/ml and 9.44 mg/ml respectively at 24 hours.

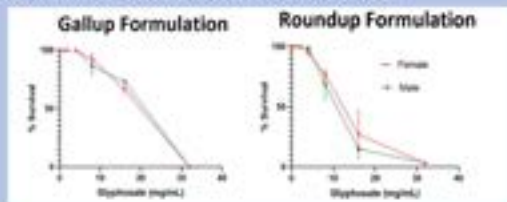


Fig 4: Graph showing the relationship between survival and concentration when exposed to 0, 1, 2, 4, 8, 16 and 32 mg/ml of glyphosate. Male and female survival is shown separately. The X-axis represents glyphosate concentration in mg/ml, and the Y-axis shows the percentage survival of flies at 24 hours of exposure. The graph is an average of three technical replicates (n1-n3) and the values plotted on the graph are an average of two biological replicates (N=1, N=2). Error bars represent standard error of mean (SEM).

B) LC 50 values were determined using Probit analysis.

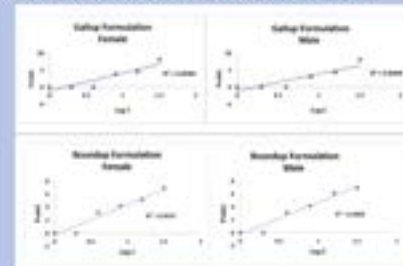


Fig 5: Representative graphs from probit analysis. Values on the X-axis represent the log concentrations and Y-axis represent the probit values. The R-value of each plot are indicated on the graph.

| Gallup Formulation  |      |
|---------------------|------|
| LC50 (mg/ml)        | 6.43 |
| LC90 (mg/ml)        | 9.99 |
| Roundup Formulation |      |
| LC50 (mg/ml)        | 9.44 |
| LC90 (mg/ml)        | 8.80 |

Figure 6: Table showing the LC 50 values derived from probit analysis at 24 hours of exposure to lethal concentration of glyphosate. The values represented on this table are an average of two biological replicates (N=1, N=2).

C) Development and fertility of *Drosophila* progenies developed from adults orally exposed to sublethal concentrations of glyphosate reduced in a dose dependent manner.

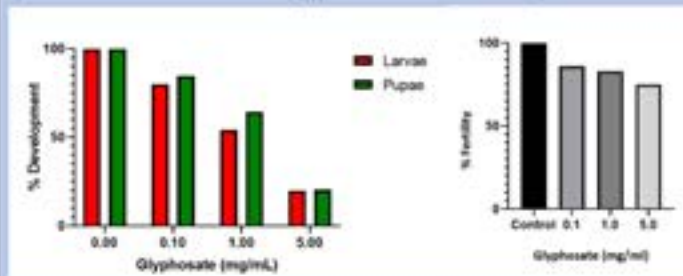


Fig 7: The effects of glyphosate on development at 10 days. Bars represent average survival from N=2 experiments and is expressed as percentage versus control. Note: Sublethal refers to concentrations that are non-lethal. This experiment is focused on understanding the relationship between concentrations considered to be non-lethal and their effects on fertility and development.



Fig 8: Showing the schematic followed for conducting fertility and development experiments.

### Future Work

- Identifying the causes of observed fertility and development defects.



### Acknowledgement

This project was funded by the TUS Presidential Doctoral Scholarship.

### References

1. Sánchez-Bayo F, 2021. DOI: <https://doi.org/10.3390/pest9080177>
2. Straw et al., 2021. DOI: <https://doi.org/10.1111/1365-2656.13857>
3. Strilbytska et al., 2022. DOI: <https://doi.org/10.1002/psrh.21893>
4. Galin et al., 2019. DOI: <https://doi.org/10.1002/psrh.21893>
5. Muller et al., 2021. DOI: <https://doi.org/10.3390/pest9070281>
6. Anheiter et al., 2018. DOI: <https://doi.org/10.3390/918980>
7. Brachigliano et al., 2023. DOI: <https://doi.org/10.3390/pest918020178>
8. Agrigem, 2024. URL: <https://www.agrigem.com/it/product/gallup-h-p-30/>
9. Bayer Crop Science, 2015. URL: <https://www.cropscience.bayer.com/usa/products/pesticides/roundup-director/>
10. Thanh et al., 2017. DOI: <https://doi.org/10.25073/2588-1094/volumes.4074>



## Regenerative Tourism as an innovative and progressive tourism development model for destinations - A case study of Ireland's Hidden Heartlands

Yi (Alex) Yu

ORCID: 0000-0001-9449-6622

Supervised by: Dr Mary Looman, Dr Tony Johnston

Faculty of Business and Hospitality, Technological University of the Shannon, Midlands Midwest, Athlone Campus

### Introduction

Tourism in Ireland has experienced significant growth pre-pandemic and although the sector was impacted negatively by the COVID-19 pandemic, the outlook for the sector is optimistic with pre-pandemic visitor numbers expected to return by summer 2024. This however, will create a challenge for planners and policymakers on how best to manage the growth in visitor numbers moving forward (Faite Ireland, 2021), along with several other obstacles such as labour shortages, inflation, just transition, restoring landscapes, and social problems relating to increased refugee numbers for example.

Regenerative tourism which is an approach that looks at tourism as an inseparable part of a large system involving the economy, communities, environment, and politics (Hussain, 2021; Hartman and Heslinga, 2023), addresses these challenges and issues and encourages a more sustainable way of travelling (Cave et al., 2022, Robina- Ramirez et al., 2022) where the main goal is for visitors to have a positive impact on their holiday destinations by taking into consideration the economic, socio-cultural and environmental resource base of destinations (King, 2022, Hussain, 2022).

### Background to the Research

The research seeks to explore regenerative tourism as an innovative model for tourism destination management in Ireland's Hidden Heartlands tourism region and to develop a regenerative tourism model that is destination-focused and takes into account the cultural and natural aspects, local development, and practices that best fit the region. The new model to be developed is based on capacity building/development approach (Cave & Dredge, 2020), system-based approach (Duxbury et al., 2021), additive approach (Matunga et al., 2020), and the place-based approach (Cheer, 2020)

### Research Aim

Develop an innovative and progressive regenerative tourism model to better manage tourism destinations; develop a best practice guide to encourage regenerative practices, focusing on Ireland's Hidden Heartlands tourism region.

### Research Objectives

- To examine existing regenerative tourism models and practices in the literature.
- To examine the current policy documents and investigate the regional government and authorities' priorities towards regenerative tourism.
- To investigate stakeholders' awareness and perceptions of regenerative tourism, focusing on tourism practitioners, tourists and local communities in the region.
- To explore and create a regenerative tourism model for destination planning and management and a best practice guide for regenerative tourism that fits the context of the Hidden Heartlands tourism region.
- To make recommendations for destination planners and policymakers for how regenerative tourism can be used as an innovative model of improved destination management of the region.



### Methods

- Case study methodology focusing on Ireland's Hidden Heartland Region
- Use qualitative content analysis to analyse national and local government strategies, plans and policies
- Conduct semi-structured interviews with tourism stakeholders such as Faite Ireland, Westmeath county council, and local business owners for example.

### References

- Cave, J. and Dredge, D. (2020) 'Regenerative tourism needs diverse economic practices', *Tourism Geographies*, 23(5), pp. 525-543. Available at <https://doi.org/10.1080/14740688.2020.1768314>.
- Cave, J. et al. (2022) 'Regenerative tourism: the challenge of transformational leadership', *Journal of Tourism Futures*, 9(2), pp. 278-313. Available at <https://doi.org/10.1108/JTF-02-2021-0036>.
- Cheer, J.M. (2020) 'Human Rebuilding: Tourism Transformation and COVID-19 - a conceptual foundation', *Tourism Geographies*, 23(5), pp. 524-526. Available at <https://doi.org/10.1080/14740688.2020.1768205>.
- Duxbury, N. et al. (2021) 'Creative Tourism Development Models towards Sustainable and Regenerative Tourism', *Sustainability*, 13(1). Available at <https://doi.org/10.3390/su13010001>.
- Faite Ireland (2021), *Key Tourism Facts 2020*, March 2021, <https://www.faitelreland.ie/Research-Insights/Research-Reports/Preliminary-Key-Tourism-Facts-2020.pdf>, 149785.aspx?Page=6&Page=6
- Faite Ireland, *Future Consumer Trends - July 2021*, *Consumer Planning & Insights*, accessed April 2023, <https://www.faitelreland.ie/Research-Insights/Visitor-Feedback/Future-Consumer-Trends-July-2021.aspx>
- Hartman, S. and Heslinga, L.M. (2023) 'The Degrading Destination: applying Kate Raworth's Doughnut Economy perspective to rethink tourism destination management', *Journal of Tourism Futures*, 9(2), pp. 279-286. Available at <https://doi.org/10.1108/JTF-02-2021-0037>.
- Hussain, A. (2021) 'A Future of Tourism Industry: Conscious Travel, Destination Recovery And Regenerative Tourism', *Journal of Sustainability and Resilience*, 0(2). Available at <https://digitalcommons.ual.edu/journal/sr/v0i0/2/>.
- King, C. (2022) 'Beyond Sustainability: A Global Study of Nature-based Solutions in Regenerative Tourism, Travel and Tourism Research Association. Advancing Tourism Research (July Preprint)'. Available at <https://scholarworks.umass.edu/theses/2022/07/20220701/08/>.
- Matunga, H., Matunga, H.K. and Lelika, S. (2020) 'FROM EXPLORATIVE TO REGENERATIVE TOURISM', Available at <https://www.researchgate.net/publication/359110411-REGENERATIVE-TOURISM-Matunga-H-Matunga-H-K-Lelika-S> (Accessed: 5 January 2024).
- Robina Ramirez, S. et al. (2022) 'Tourism governance during the COVID-19 pandemic crisis: A proposal for a sustainable model to restore the tourism industry', *Environment, Development and Sustainability*, 24(5), pp. 4292-4312. Available at <https://doi.org/10.1007/s10668-021-01701-3>.







## The Impact of Mushroom-Derived Bioactive Compounds on Immune Responses During Bone Healing

Zahra Kharat A00314813

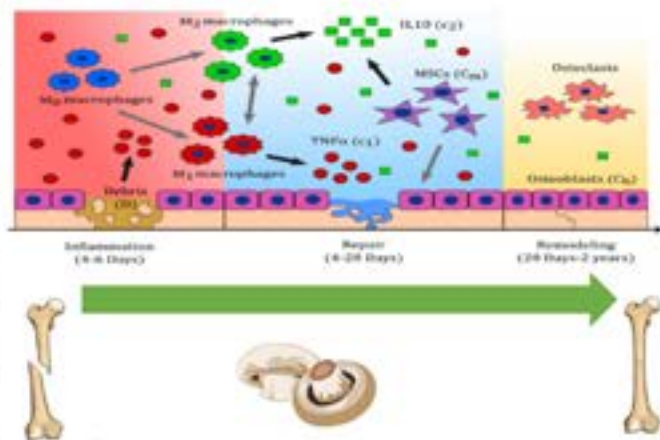
Dr Declan Devine, Dr Niamh Fahy, Prof. Nick Dunne & Dr Emma J. Murphy

### Research Question

*Is there a beneficial influence of mushroom-derived bioactive compounds on immune responses during the process of bone regeneration?*

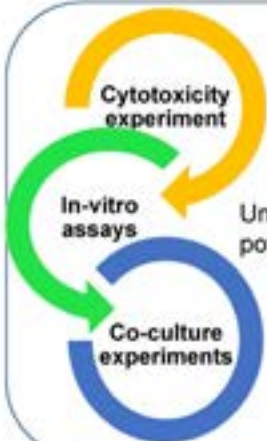
### Introduction

Bone healing relies on inflammation and regeneration unregulated inflammation hampers the process (1). Mushroom-derived bioactive compounds, recognized as potent immune modulators, stimulate immune and inflammatory responses. Documented effects include reduced proinflammatory cytokines and enhanced antioxidants in preclinical models (2,3). Despite evidence, the impact of these compounds on bone regeneration is unexplored. The study aims to investigate their effect on immune response in bone healing.

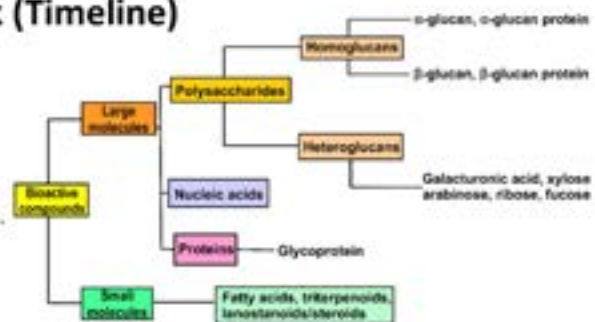


Source: Modeling the Macrophage-Mediated Inflammation Involved in the Bone Fracture Healing Process

### Future Work (Timeline)



- Assess the potential toxicity of bio-compound extracted from mushrooms.
- Understand the immune-modulation potential of Mushroom bio-compounds.
- Investigate the indirect effect of bio-compounds treated macrophages on BM-MSCs.



Source: Medicinal properties and bioactive compounds from wild mushrooms native to North America. Molecules

### Summary of Work to Date

Preparation of conditions for cultivation and extraction of the desired substance.  
Identify the laboratory techniques needed in this project.

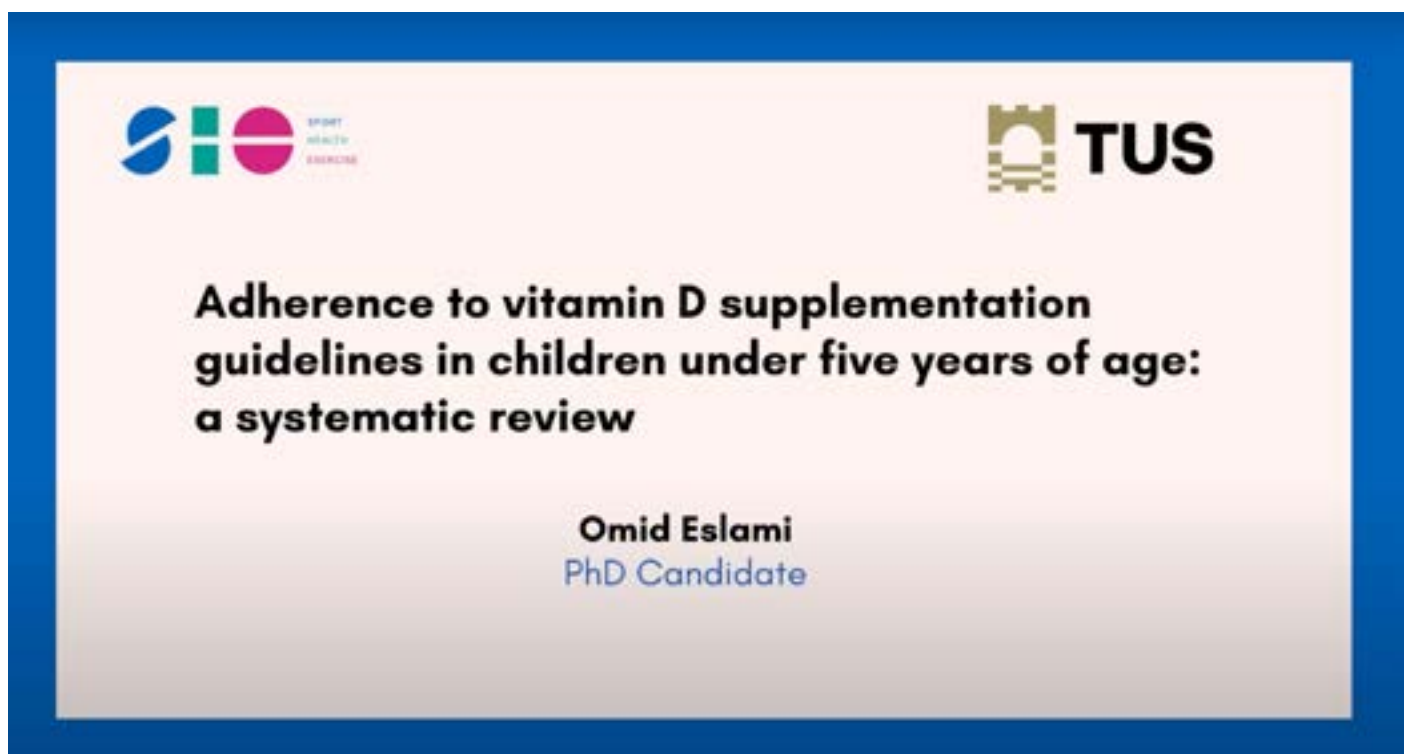
### References

- 1-Liu H, Li D, Zhang Y, Li M. Inflammation, mesenchymal stem cells and bone regeneration. *Histochemistry and cell biology*. 2018 Apr;149:393-404.
- 2-Murphy EJ, Rezoagli E, Pogue R, Simonassi-Paiva B, Abidin S, Fehrenbach GW, O'Neil E, Major I, Laffey JG, Rowan N. Immunomodulatory activity of β-glucan polysaccharides isolated from different species of mushroom—A potential treatment for inflammatory lung conditions. *Science of the Total Environment*. 2022 Feb 25;809:152177.
- 3-Murphy EJ, Rezoagli E, Major I, Rowan NJ, Laffey JG. β-glucan metabolic and immunomodulatory properties and potential for clinical application. *Journal of Fungi*. 2020 Dec 10;6(4):356.


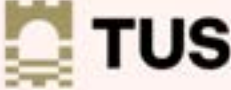
This work was supported by the TUS President's Doctoral Scholarship Fund (PDS2022)



Click to watch



The image shows a video thumbnail for a presentation slide. The slide has a white background with a blue border. In the top left corner, there is a logo consisting of three colored circles (blue, green, pink) and the text "SPORT HEALTH EXERCISE". In the top right corner, there is a logo for "TUS" featuring a stylized building icon. The main title of the slide is "Adherence to vitamin D supplementation guidelines in children under five years of age: a systematic review". Below the title, the author's name "Omid Eslami" is listed, followed by "PhD Candidate" in a smaller font.

**Adherence to vitamin D supplementation guidelines in children under five years of age: a systematic review**

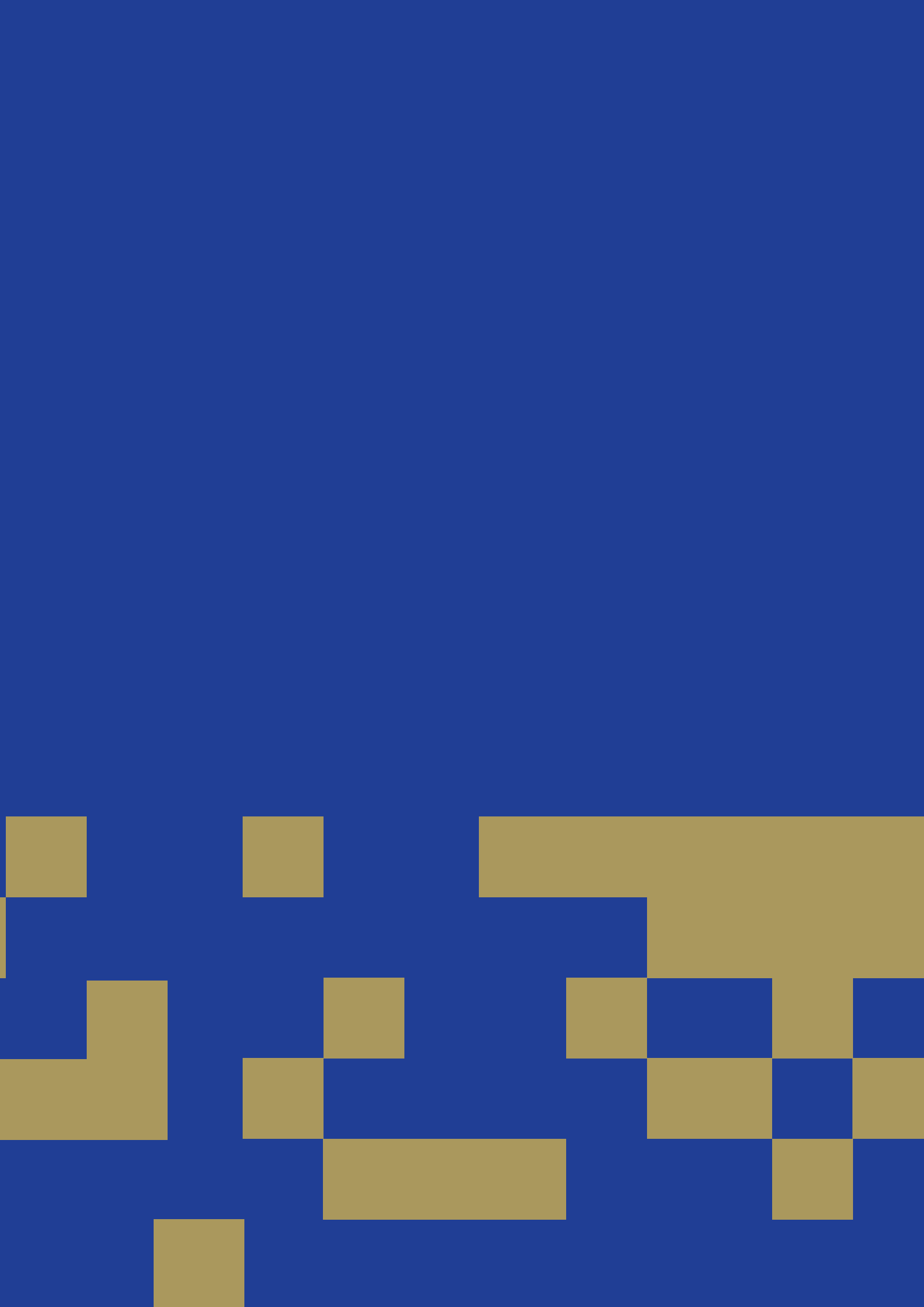
**Omid Eslami**  
PhD Candidate





# RUN-EU





# The Shaping of an Alternative Collective Memory of Dutch Colonial History: Keti Koti as a Case Study

April T. Rispens  
International Leisure, Tourism  
& Events Management (MA)

(23/24)

## 01 BACKGROUND

**Keti Koti**, meaning **'breaking chains'**, is held on July 1 every year. The KIEN (Dutch Intangible Heritage Centre), who named Keti Koti as intangible heritage, describes the event as both a **commemoration of victims of the trans-Atlantic slave trade** in Suriname and the Dutch Caribbean, and a celebration of the **statutory abolition of slavery** (1863 in Suriname). Keti Koti is part of the conversation surrounding **remembering Dutch colonial history** and the slave trade specifically and can be considered a **postcolonial development**. Until recently, this part of national history has been underexposed, despite organized efforts by various writers, scholars, and activists. Only in December 2022 did the Dutch Prime Minister apologize for the Dutch active role in the slave trade.

With the recency of these developments and prior underexposure, it is unsurprising that Dutch colonial history has had difficulty integrating into the **collective memory** of the population. From 2023 there are (political) efforts for Keti Koti to become a **national holiday**, like other commemoration events, to expose Dutch colonial history to a broad Dutch audience. The investigation of whether Keti Koti has been influential in the negotiation of alternative collective memory concerning Dutch colonial history may be a valuable insight.

## 03 AIM

The aim of this research is to explore how an alternative collective memory of Dutch colonial history can be shaped by Keti Koti.

## 07 LITERATURE REVIEW

Narrative review approach

Postcolonialism as an era  
Postcolonial society  
Dutch colonial history  
Treatment of history in the Netherlands  
Memory and memory politics  
Collective memory  
Alternative collective memory  
Commemoration practices  
Commemoration events

### Trustworthiness

- Dependability  
Justification of theoretical inferences by recording process.
- Credibility  
Validation of findings by those studied.
- Transferability  
Not typically generalizable as this is a case study.
- Naturalistic stance  
Data is collected in natural environment.

### Limitations

Sampling bias in location, low response rate due to instrument and questions.

## 08 METHODOLOGY

### Approach

- Epistemology: Interpretivist
- Ontology: Constructionist
- Tendency: Inductive
- Conduct: Qualitative

### Design

• Case study design  
Keti Koti (unit of analysis) as an exemplifying case, as it exists in a broader category of commemoration events. Design contains elements of a cross-sectional design as data will be collected at a single point in time.

### Data collection procedure

- Population  
Those who grew up in a Dutch context.
- Generic purposive sampling  
Aim for diversity in age, ethnicity, and gender in participants.

Aim for context that exemplifies social mix (ex. Utrecht station, centrally located).

- Sample size  
20-30 (data saturation possible).
- Instrument

Semi-structured interview, open questions.

### Ethical considerations

informed consent, post interview comments, confidentiality.

## 02 RELEVANCE

- **Academic:** Addressing the gap concerning the role of commemoration practices in the negotiation of collective memory of colonial history. There is a lack of knowledge concerning collective memory of colonial history, and postcolonial societal values. Keti Koti, as a newer concept, has not been studied concerning its influence.
- **Societal:** Keti Koti's aim is, broadly, to expose Dutch colonial history to a wider society. Thereby it combats the legacy of colonialism in the current society.
- **Professional:** Providing data for the NiNsee, whose goal is to establish more local Keti Koti events and nationalize the commemoration.

## 04 OBJECTIVES

- To define what Dutch colonial history looks like according to people who grew up in a Dutch context.
- To understand the role of commemoration practices in the shaping of a collective memory among people who grew up in a Dutch context.
- To assess how the values of a postcolonial society align with collective memory of Dutch colonial history.
- To evaluate the potential of Keti Koti, a commemoration event, as an instrument in the shaping of an alternative collective memory of Dutch colonial history.

## 05 PROBLEM STATEMENT

How can Keti Koti negotiate an alternative collective memory of Dutch colonial history?

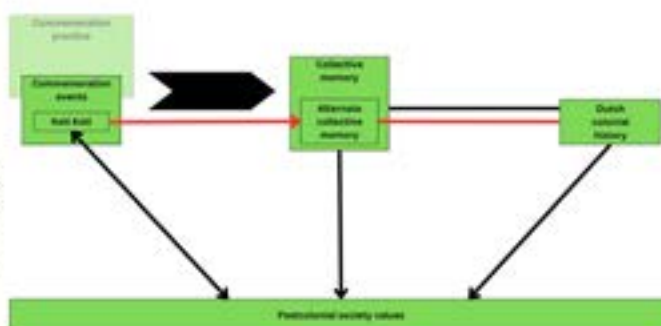


Figure 1. Conceptual model

## 06 RESEARCH QUESTIONS

- RQ 1: What does the collective memory of Dutch colonial history look like?
- RQ 2: What role do commemoration practices have on the shaping of collective memory?
- RQ 3: How does the collective memory of Dutch colonial history align with the values of postcolonial society?
- RQ 4: What potential does Keti Koti, as a commemoration event, have to the shaping of an alternative collective memory of Dutch Colonial History?

## ACKNOWLEDGEMENTS & CONTACT DETAILS

This research is supervised by Sarika van Slooten, PhD, and the second assessor is Brigitte Nibich, MA.

April T. Rispens

MA student

[april.rispens@student.nhlstenden.com](mailto:april.rispens@student.nhlstenden.com)

LinkedIn URL and/or QR-code

[www.linkedin.com/in/april-rispens-5bb80014b](https://www.linkedin.com/in/april-rispens-5bb80014b)



# Marine natural products as new therapeutic approach in the development of neuroprotective agents for Parkinson's disease

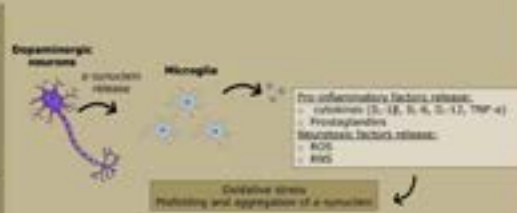
Soledade, Francisca<sup>1</sup>; Alves, Celso<sup>2</sup>; Martins, Alice<sup>1</sup>; Alvarino, Rebeca<sup>3</sup>; Pedrosa, Rui<sup>1</sup>; Alfonso, Amparo<sup>3</sup>; Silva, Joana<sup>2</sup>

<sup>1</sup> MARE—Marine and Environmental Sciences Centre, ARNET—Aquatic Research Network, Polytechnic University of Leiria, 2520-630 Peniche, Portugal  
<sup>2</sup> FARM—Marine and Environmental Sciences Centre, ARNET—Aquatic Research Network, ESTM, Polytechnic University of Leiria, 2520-619 Peniche, Portugal  
<sup>3</sup> Department of Pharmacology, Faculty of Veterinary, University of Santiago de Compostela, 37002 Lugo, Spain

## Introduction

Parkinson's disease (PD) → Chronic progressive neurodegenerative disease affecting millions of people worldwide

- Characterized by the loss of dopaminergic neurons in the substantia nigra pars compacta, which leads to the decrease of dopamine levels in the striatum, consequently affecting motor control
- Pathways of PD:
  - Chronic neuroinflammation
  - Accumulation of intracellular inclusions enriched in aggregated  $\alpha$ -synuclein
  - Autophagy
- Under inflammatory conditions, activated glial cells release pro-inflammatory factors (cytokines and prostaglandins), and neurotoxic factors (reactive oxygen/nitrogen species), contributing to oxidative stress and mediating and aggravating  $\alpha$ -synuclein. In turn, oxidized  $\alpha$ -synuclein triggers inflammatory responses of microglia releasing pro-inflammatory cytokines (TNF- $\alpha$ , IL-1 $\beta$ , and IL-6).
- Currently available drugs alleviate the symptoms of PD, but do not block the disease progression, only compensating for the loss of dopamine and dopaminergic function
- One of the main bottlenecks linked with developing new therapeutics for PD is the difficulty of many drugs to reach the brain, making it critical to develop more effective therapeutic agents to overcome this issue, having the capacity to cross the intestinal and blood-brain barriers



## Background

### Marine Natural Products

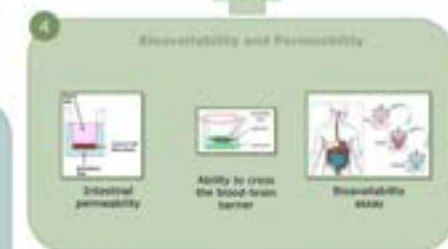
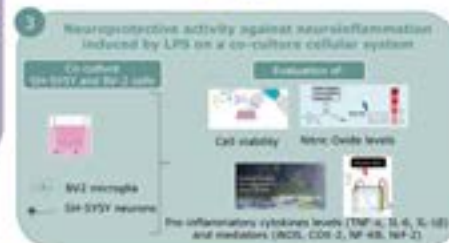
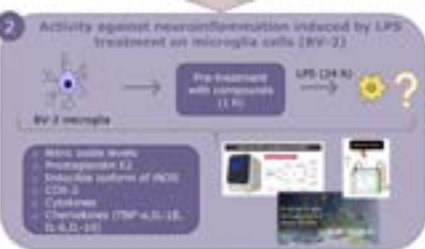
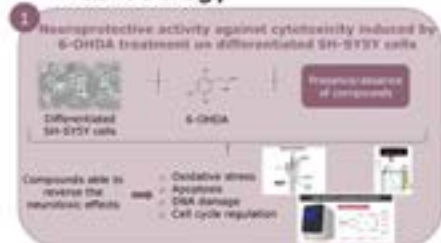
Nature has inspired the discovery of many drugs and marine organisms are emerging as a great and not yet fully explored source of new molecular entities with high bioactive potential. Twenty-nine compounds isolated from marine organisms have already demonstrated potential for PD therapeutics, however, only five compounds have entered in clinical trials.



### Neuroprotective and anti-inflammatory activities:

- Regulating the antioxidant defenses on SH-SY5Y cells
- Preventing mitochondrial dysfunction
- Activating apoptosis
- Decreasing inflammatory processes
- Inhibiting the NF- $\kappa$ B pathway

## Methodology



Do these compounds have the potential to mediate neuroprotective and anti-neuroinflammatory activities in different models of PD?

## References & Acknowledgments

1 - J. Silva et al., "Unlocking the potential of algae-derived for Parkinson's disease therapeutics: Neuroprotective and anti-inflammatory activities," *Pharmacol Rep*, vol. 168, Jun. 2021, doi: 10.1016/j.phrs.2021.101589

2 - J. Silva et al., "Luteolin, a new therapeutic option for neurological diseases? In vitro neuroprotective and anti-inflammatory activities of a monoflavanone lactone isolated from *Callitriche baccata*," *Int J Mol Sci*, vol. 22, no. 4, pp. 1-24, Feb. 2021, doi: 10.3390/ijms22041286

3 - J. Soledade and C. Gonçalves, "Study of the neuroprotective effects of heptanes isolated from the red marine alga *Sphaerococcus corallophilus* in an in vitro model of Parkinson's disease," *Master thesis*, 2020, Instituto Politécnico de Leiria

4 - L. Lago et al., "Small Extracellular Vesicles Secreted by Regenerative Astrocytes Rescue Cell Death and Preserve Mitochondrial Function in Parkinson's Disease," *Adv Healthc Mater*, vol. 11, no. 26, p. 2201205, Oct. 2022, doi: 10.1002/adhm.202201205



## Get in Touch



Scan to view LinkedIn profile



Francisca Soledade Santos  
3rd PhD year student  
Instituto Politécnico de Leiria

# An analysis of film tourism as a crucial strategy in the competitiveness of the creative destination: Comparatively examining Portugal and Ireland

Isa Neves, PhD Candidate

GROD: 0000-0002-6983-6207

Supervised by Dr. Kelly Maguire and Dr. Nuno Almeida, and funded by FUS/21

## INTRODUCTION

Film tourism is increasingly used as a tool for captivating and attracting tourists to destinations, creating socio-cultural, economic, and environmental impacts on localities and residents (Hudson & Ritchie, 2006; Jari & Mwakiyuna, 2021). It is viewed as a catalyst for economic growth and image change and although tourism planners have limited control over the content of the films produced in respective destinations and how destinations are portrayed in films, the imaginary and visual representations of destinations, negative or distorted from their original identities, are still useful in promoting tourist destinations (Liu et al., 2020). Busby & Klug (2001) refer to increased revenue generation, visitor flows, multiplier effects, infrastructure development, and improved destination image as some potential positive impacts of film tourism. However, Moon and Kim (2015) discussed the potential negative impacts on communities and the environment such as increased traffic, insufficient parking, disruption to lifestyle and loss of privacy. In light of this, this research sets forth to establish how film tourism can be used by destination planners as a sustainable and creative tool for destination competitiveness and resilience. It aims to do this by comparatively examining Ireland and Portugal in order to determine the priority placed on film tourism development and marketing by destination planners. It also sets forth to examine perceptions of communities from film tourism locations on the impacts of film tourism given that community support is incremental for tourism development.

## RESEARCH APPROACH AND METHODOLOGY



In the first phase of this mixed methods approach (quantitative content analysis), the document's analysis was based on specific criteria such as the frequency of references to film tourism in the documents; the types of policies and marketing strategies related to film tourism in the documents; and the impacts of film tourism addressed in the documents. By doing so, it was possible to identify patterns in the data to help paint a picture of the extent to which national and regional-level tourism policies and strategies prioritise film tourism.

## FINDINGS AND ANALYSIS FOR IRELAND

Table 1 - Current Priority placed on Film Tourism in existing national plans and policy documents in Ireland

| Year of publication   | Policy Documents |    |    |    |    |    |    |     |     |     | Total |
|---|------------------|----|----|----|----|----|----|-----|-----|-----|-------|
|   | FD               | FD | FD | FD | FD | FD | FD | FD  | FD  | FD  |       |
| Number of pages   | 12               | 11 | 18 | 11 | 20 | 17 | 20 | 20  | 20  | 20  | 152   |
| Frequency of words  |                  |    |    |    |    |    |    |     |     |     |       |
| Tourism   | 10               | 10 | 41 | 17 | 11 | 44 | 21 | 114 | 116 | 112 | 204   |
| Film festival   | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0     |
| Film  | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0     |
| Film production   | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0     |
| Screen  | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0     |
| Production  | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0     |
| Film industry   | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0     |
| Media production  | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0     |
| Film production   | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0     |
| Production  | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0     |
| Strategic Marketing   |                  |    |    |    |    |    |    |     |     |     |       |
| Is there a strategy for film tourism?                                 |                  |    |    |    |    |    |    |     |     |     |       |
| Do they mention specific sites or in general?                         |                  |    |    |    |    |    |    |     |     |     |       |
| Do they mention specific film festivals?                              |                  |    |    |    |    |    |    |     |     |     |       |
| Do they mention specific destinations?                                |                  |    |    |    |    |    |    |     |     |     |       |
| Are Film Tourism Impacts recognised within existing policy documents? |                  |    |    |    |    |    |    |     |     |     |       |
| Economic impacts  |                  |    |    |    |    |    |    |     |     |     |       |
| Sociocultural impacts   |                  |    |    |    |    |    |    |     |     |     |       |
| Environmental impacts   |                  |    |    |    |    |    |    |     |     |     |       |

In Figure 1, the central axis illustrates the terminology used to describe the content of the 11 documents. The horizontal axis illustrates the policy documents which were examined, and coded (FD) = Tourism Development & Innovation - A Strategy for Investment 2017-2022, produced by Fáilte Ireland. The number in the cell illustrates the total number of times each keyword appears within the chosen documents. Table 2 follows the same structure.



Figure 1 - South Coast, location of the film festival location

- None of the documents in Ireland recognises the concept of Film Tourism;
- Therefore, there is no standalone strategy to address Film Tourism in tourism-related policies and strategies in Ireland;
- However, some policies do state the promotion of Ireland as a location for filming and the development of the film tourism industry;
- When it comes to the impacts of Film Tourism in Ireland only the economic and the sociocultural impacts are recognised by a total of 3 documents.

## FINDINGS AND ANALYSIS FOR PORTUGAL

Table 2 - Current Priority placed on Film Tourism in existing national and regional Tourism Strategies and Marketing Documents in Portugal

| Year of publication   | National Documents |     |     |     |     |     | Regional Documents |     |    |     |     |     |
|---|--------------------|-----|-----|-----|-----|-----|--------------------|-----|----|-----|-----|-----|
|   | FD                 | FD  | FD  | FD  | FD  | FD  | FD                 | FD  | FD | FD  | FD  |     |
| Number of pages   | 66                 | 90  | 76  | 103 | 50  | 60  | 40                 | 134 | 47 | 103 | 134 | 117 |
| Frequency of words  |                    |     |     |     |     |     |                    |     |    |     |     |     |
| Tourism   | 142                | 440 | 319 | 176 | 241 | 172 | 71                 | 413 | 76 | 214 | 422 | 441 |
| Film festival   | 0                  | 0   | 0   | 0   | 0   | 0   | 0                  | 0   | 0  | 0   | 0   | 0   |
| Film  | 0                  | 0   | 0   | 0   | 0   | 0   | 0                  | 0   | 0  | 0   | 0   | 0   |
| Film production   | 0                  | 0   | 0   | 0   | 0   | 0   | 0                  | 0   | 0  | 0   | 0   | 0   |
| Screen  | 0                  | 0   | 0   | 0   | 0   | 0   | 0                  | 0   | 0  | 0   | 0   | 0   |
| Production  | 0                  | 0   | 0   | 0   | 0   | 0   | 0                  | 0   | 0  | 0   | 0   | 0   |
| Film industry   | 0                  | 0   | 0   | 0   | 0   | 0   | 0                  | 0   | 0  | 0   | 0   | 0   |
| Media production  | 0                  | 0   | 0   | 0   | 0   | 0   | 0                  | 0   | 0  | 0   | 0   | 0   |
| Film production   | 0                  | 0   | 0   | 0   | 0   | 0   | 0                  | 0   | 0  | 0   | 0   | 0   |
| Production  | 0                  | 0   | 0   | 0   | 0   | 0   | 0                  | 0   | 0  | 0   | 0   | 0   |
| Strategic Planning for Film Tourism                                       |                    |     |     |     |     |     |                    |     |    |     |     |     |
| Is there a strategy for film tourism?                                     |                    |     |     |     |     |     |                    |     |    |     |     |     |
| Do they mention specific sites or in general?                             |                    |     |     |     |     |     |                    |     |    |     |     |     |
| Do they mention specific film festivals?                                  |                    |     |     |     |     |     |                    |     |    |     |     |     |
| Are Film Tourism Impacts recognised within existing plans and guidelines? |                    |     |     |     |     |     |                    |     |    |     |     |     |
| Economic impacts  |                    |     |     |     |     |     |                    |     |    |     |     |     |
| Sociocultural impacts   |                    |     |     |     |     |     |                    |     |    |     |     |     |
| Environmental impacts   |                    |     |     |     |     |     |                    |     |    |     |     |     |

- The national documents in Portugal do not recognise the concept of Film Tourism, being only addressed in 3 regional documents (from Center of Portugal and Algarve regions);
- Only 3 regional documents refer to film tourism strategies;
- Regarding Film Tourism impacts only the economic and sociocultural impacts are acknowledge in PD14, from the Algarve region.



Figure 2 - Alentejo, Portugal - Heart of the Algarve region

## CONCLUSION AND NEXT STEPS

- The results highlight the limited focus on film tourism in Ireland and Portugal;
- Both countries aboard different films and film festivals (a form of film tourism) in some of their documents;
- Only the economic and social-cultural impacts are briefly explored in the documentation for Ireland and Portugal. There is no recognition of the environmental impacts of film tourism;
- Polymakers and stakeholders must recognize and evaluate economic, sociocultural, and environmental impacts for fully harnessing film tourism potential in destination development and sustainability;
- There is a need for further research and a move to qualitative research to examine nuanced perspectives and insights of those intricately involved in the development and marketing of film tourism.

## REFERENCES

Busby, D., & Klug, J. (2001). Movie-induced tourism: The challenge of measurement and other issues. *Journal of Tourism Marketing*, 15(4), 114-122. <https://doi.org/10.1080/10834100108839880>

Hudson, S., & Ritchie, J. R. B. (2003). Promoting destinations via film tourism: An empirical investigation of supporting marketing initiatives. *Journal of Travel Research*, 42(4), 387-396. <https://doi.org/10.1177/0047082403253202>

Jari, D., & Mwakiyuna, J. K. F. (2021). Residents' perception of festival impacts and satisfaction: A focus on Tanzania International Film Festival (IFF). *International Journal of Event and Festival Management*, 12(4), 360-376. <https://doi.org/10.1108/IJEFM-05-2021-0020>

Liu, Y., Cho, W. S., Hopkins, P., & Chhabra, A. N. (2020). Framing film-induced tourism into a sustainability perspective: From economic, historical and Malaysia. *Sustainability* (Basel, Switzerland), 12(7), 1-19. <https://doi.org/10.3390/s120701270>

Toon, Y., Kim, S., & Kim, S. (2015). Successful and unsuccessful film festival destinations: From the perspective of tourist-local residents' perceptions of film tourism impacts. *Tourism Analysis*, 18(2), 201-211. <https://doi.org/10.1177/1083410014273155>



# VIRTUAL CULTURAL TOURISM: IMMERSIVE TECHNOLOGIES

**AUTHORS**  
Scholarship holder:  
Victoria Apajalahti, CITUR\*, Polytechnic of Leiria  
victoria.apajalahti@ipleiria.pt

**Research Coordinators:**  
Célia Rafael, CITUR\*, Polytechnic of Leiria, ORCID ID 0000-0001-7388-028X  
Sofia Lopes, CITUR\*, Polytechnic of Leiria, ORCID ID 0000-0002-9787-3866  
Ana Pires, CITUR\*, Polytechnic of Leiria, ORCID ID 0000-0002-1149-7898

\*CITUR Centre for Tourism Research, Development and Innovation



**FUNDERS**  
This work is financed by national funds through FCT - Fundação for Science and Technology, IP, within the scope of the reference project UIDB/04470/2020

## INTRODUCTION

In recent years, virtual reality (VR) and augmented reality (AR) technologies have emerged as promising tools for enhancing the tourist experience. The integration of VR/AR into tourism and cultural environments offers immersive and interactive opportunities that redefine traditional ways of travelling, learning and interacting with a destination. This research explores the use of VR technology in cultural tourism through customer experiences, using a mixed-methods case study and drawing insights from recent studies in the field.

## OBJECTIVE

The purpose of our study is to examine visitor experience through attitudes, experiences, expectations, and motivations correlated with virtual reality characteristics in the context of cultural tourism with the help of a case study. We wish to contribute to the field by understanding the customers views and needs in order to develop the usage of immersive technologies in cultural tourism.

## VR SOLUTIONS

For this study a inventory of VR solutions was conducted. The focus is on products that are locally at a destination while online immersive experiences are more popular. Vienna has five VR cultural tourism solutions which of two are tours, one walking, one with bus, and three solutions that are "films" seen at a room designated for that.

## METHODOLOGY

This study is done using a mix of quantitative and qualitative methods. As the quantitative method a customer survey was done and presented to the customers of VR Tours Vienna. While as a qualitative method text analysis of online reviews from Google and TripAdvisor of the same product is done.

### QUESTIONNAIRE AT VR TOURS VIENNA

So far 60 responses gathered. Data collection was done actively during the weekends in November and December.

### TEXT ANALYSIS OF ONLINE CUSTOMER REVIEW

In total 229 online reviews are being analyzed. The reviewers are categorized by their language, sex (M/F/N), number of reviews, and "travel group" e.g. family, solo, friends etc. Preliminary results:

- Overall high scores 4.8 in Google, 5 in TripAdvisor
- Content quality is getting both good and critical reviews. Nearly 80% of reviews who gave less than 5 stars commented the quality needing improvement.

### CASE STUDY: VR TOURS VIENNA

VR TOURS Vienna is a private company that is offering a 2 hour guided walking tour of the UNESCO protected old town with 6 stops to watch VR films of the same location but in historical context. Operating since 2021.



| Source and construct of question               | Constructs in our study | Measurements   |
|--|-------------------------|--|
| VR content in destination (Chung et al., 2019) | VR content quality      | through user ratings - the history of films              |
| VR content in destination (Chung et al., 2019) | VR content quality      | The VR content quality was measured through user ratings |
| VR content in destination (Chung et al., 2019) | VR content quality      | The VR content quality was measured through user ratings |
| VR content in destination (Chung et al., 2019) | VR content quality      | The VR content quality was measured through user ratings |
| VR content in destination (Chung et al., 2019) | VR content quality      | The VR content quality was measured through user ratings |
| VR content in destination (Chung et al., 2019) | VR content quality      | The VR content quality was measured through user ratings |
| VR content in destination (Chung et al., 2019) | VR content quality      | The VR content quality was measured through user ratings |
| VR content in destination (Chung et al., 2019) | VR content quality      | The VR content quality was measured through user ratings |
| VR content in destination (Chung et al., 2019) | VR content quality      | The VR content quality was measured through user ratings |
| VR content in destination (Chung et al., 2019) | VR content quality      | The VR content quality was measured through user ratings |

The following dimensions are relevant when studying and evaluating the impact of virtual experiences in tourism



## PRELIMINARY RESULTS

### We are finding out...

**USER ACCEPTANCE**

The level of awareness and willingness of users regarding the use of immersive technologies in cultural tourism experiences

**USEFULNESS AND PSYCHOLOGICAL RESPONSES**

The relationship between the perceived ease and usefulness of VR and AR in the psychology of destination of users

**SUSTAINABILITY**

How VR in cultural tourism can contribute to sustainability through user experiences, economic, and social perspectives

- Extended realities in cultural tourism are still looking to find their place



### Growing market and existing customer needs are shaping the industry



## CONCLUSION

- All empirical studies found positive results on visitor experience
- Recognized potential of AR and VR in the cultural tourism sector
- Benefits of extended realities are:



Her et al. 2024; Loh et al. 2022; Lu et al. 2023; Paredes et al. 2022

## RECOMMENDATIONS

Based on previous literature and findings we are not able to process the field would get use of further research in these topics:

- Customer motivations to use VR in cultural tourism
- Terminology for extended reality products in tourism
- The level of satisfaction between a virtual and physical visits
- Artificial and economical perspective

### NOTE

This research is still ongoing and will be finalized by the end of March 2024.

## RELATED LITERATURE

Innocente, C., Ulrich, L., Mota, S., & Viegas, S. (2023). A framework study on the use of immersive XR technologies in the cultural heritage domain. *Journal of Cultural Heritage*, 32, 269–283. <https://doi.org/10.1016/j.culher.2022.06.001>

Yak, H., Jung, Y. H., Kim, S., & Chung, M. C. (2020). Experiencing immersive virtual reality in museums. *Information & Management*, 57(4), 91229. <https://doi.org/10.1016/j.im.2019.02.029>

Yu, L. F. (2020). Hwang, S. C. (2020). Could virtual reality effectively market sites travel in a heritage destination? *Tourism Management*, 78, 104921. <https://doi.org/10.1016/j.tourman.2019.104921>

Pratiwi, E. H., Thompson, N., & Priddey, S. (2022). Immersive technologies for tourism: a systematic review. *Information Technology & Tourism*, 20(2), 242–261. <https://doi.org/10.1007/s40758-021-00218-7>

### CONTACT

Victoria Apajalahti  
victoria.apajalahti@ipleiria.pt



**Click to watch**





**TUS**

