



## Conference Proceedings: International Digital Mental Health & Wellbeing Conference

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# Conference Proceedings

## International Digital Mental Health & Wellbeing Conference

21<sup>st</sup>-23<sup>rd</sup> June 2023, Ulster University, Belfast campus, York Street, Northern Ireland, UK.

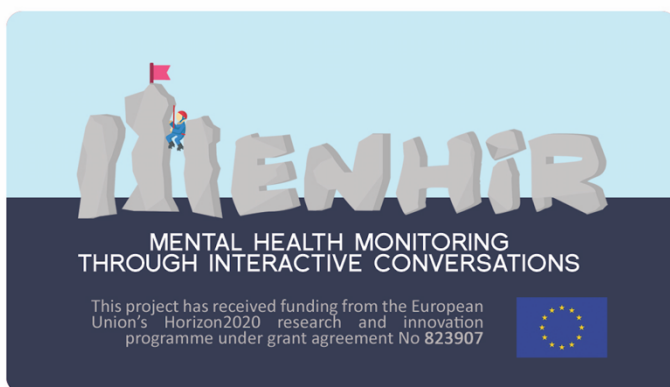
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Editors / Chairs: Raymond Bond, Edel Ennis, Maurice Mulvenna

### DOI:

A @MenhirH2020 conference/workshop (<https://menhir-project.eu/>).

Special Theme: Conversational systems for mental health



The conference was organised and supported by the MENHIR project - 'Mental health monitoring through interactive conversations' (funded by H2020 EU research and innovation programme under grant agreement No 823907).

This conference has also received sponsorship and support from the HSC R&D office in Northern Ireland. Conference was hosted by Ulster University.



## **Conference programme committee**

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- Dr Paul Best, Queen's University Belfast
- Dr Andrea Bickerdike, Munster Technological University
- Prof Raymond Bond, Ulster University
- Dr Con Burns, Munster Technological University
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- Courtney Potts, Ulster University
- Jonathan Smyth, Action Mental Health
- Kate Turley, Chroma Lighting
- Dr Maria Wolters, University of Edinburgh
- Prof Huiru Zheng, Ulster University

## Editorial:

# Working together to close the gap between digital mental health research and real world implementation: Facilitating dialogues between academics, service providers, industry and the public

Raymond Bond<sup>1</sup>, Edel Ennis<sup>1</sup>, Maurice Mulvenna<sup>1</sup>, Zoraida Callejas<sup>2</sup>

<sup>1</sup> Ulster University

<sup>2</sup> University of Granada

The programme for the International Digital Mental Health & Wellbeing Conference included 45 talks and attracted around 120 delegates. The conference was organised by the MENHIR project (*'Mental health monitoring through interactive conversations'*, funded by H2020 EU research and innovation programme under grant agreement No 823907) as part of the project's final year to help share its research findings whilst also attracting other researchers, industry and service providers in the field to disseminate their related digital mental health research, projects, studies, results and services.

The conference included a free pre-conference public event to discuss the value of digital mental health, chaired by Professor Maurice Mulvenna (Ulster University). This event was advertised to the public using Eventbrite and using twitter (including via Action Mental Health, a partner on the MENHIR project). Professor Zoraida Callejas (coordinator of the MENHIR project, University of Granada) introduced this event by providing an overview of the MENHIR project and then using an online quiz type activity around the use of digital technology. This activity included interesting insights into the benefits and drawbacks of mental health chatbots. Following this, Dr Colin Gorman (Ulster University and Pneuma Healthcare) gave a talk on how digital technology could help improve services in the area of mental health and wellbeing. This was followed by an open discussion that was facilitated by Dr Edel Ennis (Ulster University) with Dr Colin Gorman and Professor Maurice Mulvenna.

The conference programme comprised of 8 sessions, each representing a theme: digital interventions, virtual reality & gaming, data science & AI, child, youth & student mental health, social media & media reporting, digital technology & dementia, talks from industry & service providers and, finally, a MENHIR-themed workshop (sessions) on conversational systems for mental health & Natural Language Processing (NLP). The latter included a keynote from the coordinator of the MENHIR project (Professor Zoraida Callejas) as well as talks from some of the MENHIR partners. It also included talks from other researchers undertaking related studies in the field of conversational systems/NLP in mental health.

The conference included four excellent keynotes. This included a keynote by Professor Gavin Doherty (Trinity College Dublin) who presented human computer interaction research in digital mental health. Professor Ciara McCabe also gave a keynote about neuroscience, reward functions and how we can use ecological momentary assessment to collect data. Professor John Torous (Harvard Medical School) presented research related to mental health apps and the opportunities and challenges that they entail. And as already indicated, Professor Zoraida Callejas presented research on using speech analytics and NLP in mental healthcare. The conference also included a lunch time seminar to provide advice to early career researchers regarding writing papers and publishing, which was facilitated by Tillie Cryer (Nature Portfolio) and Alison Cuff (BMC digital health).

Four presentations were awarded during the conference. This included an award to Yasmin Ali (University of Nottingham) who presented work on a novel online digital intervention called NEON. Rachel Reeves (Queens University Belfast) received an award based on a presentation on using VR exposure therapy in public speaking. Asher Cohen (Harvard Medical School) was awarded for a presentation based on MindApps.org which is a website that catalogues mental health apps. Natalie Divin (Verbal Arts Centre) was awarded based on a presentation on a novel digital mental health bibliotherapy app for children.

The conference highlighted the excellent digital mental health research that is going on across many different institutions. It also highlighted the benefit from interdisciplinary teams of researchers working together

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designing and testing novel digital interventions as well as taking an interdisciplinary approach to data science. The conference also helped disseminate the range of novel digital interventions and tools that companies and service providers have designed for clients. It was evident that the conference helped bring together the public (at the free public event), academics, healthcare professionals and industry leaders as well as charities and other service providers. We believe that this inclusive approach is important to bridging the gap between research and real world implementation to make much needed progress in digital mental health.

Finally, having completed the first edition of the conference, we will now host the 2nd International Digital Mental Health and Wellbeing Conference in 2024 in Derry-Londonderry, Northern Ireland.

## **Keynote**

# **Examining real life reward function using digital EMA to find targets for anhedonia in adolescents**

Ciara McCabe, Reading University

Adolescence is a period of change that crucially increases vulnerability to depression. Studies report blunted neural responses to reward that relate to positive affect and depression symptoms in adolescents. However how these results relate to the symptom of anhedonia (lack of pleasure and interest) in adolescents is not entirely clear.

We have been examining how the brain responds to reward and aversion in those at risk of depression and adolescents with depression and anhedonia symptoms. Using fMRI we have shown how different components of reward and aversion processing such as the anticipation and consummation relate to anhedonia. We have also begun to measure effort for reward as a proxy for motivational deficits in depression. Our work shows that there are blunted brain responses to reward and aversion in adolescents with symptoms of depression and reduced physical effort.

However, how the dimensional experience of anhedonia correlates with the subcomponents of reward processing in daily life is unknown. Recently we have begun to use experience sampling methodology to assess the human reward process in adolescents with depression in daily life using a smart phone app. The goal is to reveal the determinants of active behaviour and positive mood in real life in young people. Knowing this can help us develop new interventions for anhedonia.

Ciara McCabe is Professor of Neuroscience, Psychopharmacology and Mental Health and a University Research Fellow at Reading University. She has been director of the Neuroscience of Reward Group at Reading since 2013. She examines the processing of primary and secondary rewards at the behavioural and neural level and how this relates to the symptom of anhedonia in depression. She also examines how drug treatments interact with the reward response.

### **Biography**

Ciara did her BSc in Psychology at Queens University, Belfast. She did her PhD on the effects of anxiolytic drugs on animal models of frustrative non-reward at the University of Ulster, with Prof Leslie and in collaboration with Merck, Sharpe and Dohme. She did her first post doc with Prof Nader in primate models of drug addiction at Wake Forest, NC, USA.

Ciara then moved to the Experimental Psychology Department at Oxford University to work on the brains response to primary rewards in humans with Professor Rolls and subsequently to the Psychiatry Department at Oxford University to work on neuropsychopharmacology and reward processing in patient and at-risk groups with Prof Harmer and Prof Cowen.

She was awarded the Senior Non-Clinical Psychopharmacology Award and two separate In-Vivo Awards from The British Association of Psychopharmacology (BAP). She was also awarded the Rafaelsen Investigator Award from The International College of Neuropsychopharmacology, a Fellowship Award from the European College of Neuropsychopharmacology and an Eli Lilly Fellowship Award presented at the BAP. She has held funding from the Medical Research Council and various Industry collaborators.

Ciara is also Director of the Reading Scholars Programme in Psychology a widening participation programme for under-represented students. Ciara was an elected BAP councillor and trustee of the charity Immigrant Counselling and Psychotherapy (ICAP) for 5 years.

## **Keynote**

# Speech and language technologies in digital mental healthcare

Zoraida Callejas Carrión, University of Granada

### **Biography**

Zoraida Callejas is Associate Professor at the University of Granada (Spain), from which she obtained a PhD in 2008. Her research focuses on areas related to dialogue systems, conversational systems, emotion processing, affective computing and user modelling. She has published more than 150 contributions to scientific journals, books and conferences, and has published 2 books. She has been an invited researcher at Technical University of Liberec (Czech Republic), University of Trento (Italy), Ulster University (UK), Technical University of Berlin (Germany), Ulm University (Germany), and Télécom ParisTech (France), among others. She has participated in more than 15 projects in European, Spanish and local calls, she currently coordinates the EU H2020 project MENHIR, with a consortium of 8 international partners.

The main focus of MENHIR is the use of conversational technologies for mental health. She is also currently coordinating the Andalusian R&D project BonAppPetit related to the use of conversational systems to foster healthy habits in children, and the Spanish National project GOMINOLA on architectures based on microservice orchestration for the development of dialogue systems.

## **Keynote**

# Smartphone Digital Psychiatry: Understanding New Data, Clinical Opportunities, and Marketplace Apps

John Torous, Harvard Medical School

### **Biography**

John Torous, MD MBI is director of the digital psychiatry division, in the Department of Psychiatry at Beth Israel Deaconess Medical Center (BDIMC), a Harvard Medical School affiliated teaching hospital, where he also serves as a staff psychiatrist and assistant professor. At a system level, Dr. Torous is the medical director of behavioural health informatics for Beth Israel Lahey Health. He has a background in electrical engineering and computer sciences and received an undergraduate degree in the field from UC Berkeley before attending medical school at UC San Diego. He completed his psychiatry residency, fellowship in clinical informatics, and master's degree in biomedical informatics at Harvard. Dr. Torous is active in investigating the potential of mobile mental health technologies for psychiatry and has published over 250 peer reviewed articles and 5 book chapters on the topic. He directs the Digital Psychiatry Clinic at BIDMC which seeks to improve access to and quality of mental health care through augmenting treatment with digital innovations. Dr. Torous serves as editor-in-chief for the journal JMIR Mental Health, web editor for JAMA Psychiatry, and currently chairs the American Psychiatric Association's Health IT Committee.



## **Keynote**

# The path towards the personal: a HCI perspective on Digital Mental Health

Gavin Doherty, Trinity College Dublin

Using a digital mental health technology is inherently a sensitive and private experience. Despite sustained interest in the possibility of in-the-moment interventions leveraging the sensing capabilities of mobile phones and wearable devices, currently available systems do not necessarily deliver a personal and personalised experience. In this talk, I will discuss our efforts to support more personal and tailored experiences for the users of digital mental health interventions, looking at the design space of these interventions, considering motivations, feasibility, and acceptance. The talk will particularly consider possibilities for integration of Machine Learning capabilities within mental health interventions, and some of the difficulties surrounding these.

### **Biography**

Dr. Gavin Doherty is a Professor and Fellow at the School of Computer Science and Statistics at Trinity College Dublin, Ireland. He obtained his D.Phil. at the University of York, UK. He conducts research in the area of Human Computer Interaction (HCI), with a focus on digital health, and leads the Health Technology Design Group at TCD. The ultimate goal of his research is to better understand human interactions with technology, and use this understanding in the design of new technologies. In the area of digital mental health, he has led a team in the development of a series of innovative technology interventions which have had a profound impact on the delivery of digital mental health services worldwide. He led the development of the SilverCloud platform for human-supported online mental health interventions, which has been used to deliver evidence-based interventions to over 1 million people. The focus of his work has been on supporting and extending the reach of mental health professionals, and designing engaging systems in which clients have a greater degree of agency. Recent work has investigated human-centred approaches to the integration of machine learning in mental health.

## Peer reviewed abstracts

Session: Digital interventions

### Stakeholder perspectives and experiences of the implementation of remote mental health consultations during the COVID-19 pandemic: a qualitative study

Emer Galvin [1], Shane Desselle [2], Blánaid Gavin [3], Etain Quigley [4], Mark Flear [5], Ken Kilbride [6], Fiona McNicholas [3], Shane Cullinan [1], John Hayden [1]

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[2] Touro University California, California, USA

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[5] Queen's University Belfast, Belfast, UK

[6] ADHD Ireland, Dublin, Ireland

**Corresponding author:** Emer Galvin

**Keywords:** Telemedicine, telemental health, telepsychiatry, COVID-19, implementation, remote consultations

**Background:** Remote mental health consultations were swiftly implemented across mental health services during the COVID-19 pandemic. Research has begun to inform future design and delivery. Exploring the in-depth experiences of those involved is important to understand the complex factors that influence implementation. The aim of this study was to explore stakeholder perspectives of the implementation of remote mental health consultations during the COVID-19 pandemic in Ireland.

**Methods:** A qualitative study was conducted whereby semi-structured, individual interviews were undertaken with mental health providers, service users, and managers (n = 19). Interviews were conducted between November 2021 and July 2022. The interview guide was informed by the Consolidated Framework for Implementation Research (CFIR). Data were analysed thematically using a deductive and inductive approach.

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Results: Six themes were identified. The advantages of remote mental health consultations were described, including convenience and increased accessibility to care. Participants described varying levels of success with implementation, citing complexity and incompatibility with existing workflows as barriers to adoption. Participants perceived remote mental health consultations to be satisfactory but not equivalent to in-person care in terms of quality of care. Views about the inferior quality of remote consultations stemmed from beliefs about the inhibited therapeutic relationship and a possible reduction in effectiveness compared to in-person care. Whilst a return to in-person services was mostly preferred, participants acknowledged a potential role for remote consultations in certain circumstances.

Conclusions: Remote mental health consultations were welcomed as a means to continue care during the COVID-19 pandemic. Their swift and necessary adoption placed pressure on providers and organisations to adapt quickly, navigating challenges and adjusting to a new way of working. Further consideration of the importance of the therapeutic relationship and fostering positive provider beliefs and feelings of competency are needed to ensure satisfactory and effective implementation of remote consultations going forward.

## Session: Digital interventions

# Utilisations of an online mental health recovery narrative intervention (NEON)

Yasmin Ali, [1], Stefan Rennick-Egglestone [1], Fiona Ng [1], Joy Llewellyn-Beardsley [1], Caroline Yeo [1], Donna Franklin [2], Mike Slade [1], [3].

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[2] NEON Lived Experience Advisory Panel, Nottingham, UK

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**Corresponding author:** Yasmin Ali

**Keywords:** Mental health intervention, recovery narratives, clinical trials, NEON

## INTRODUCTION

The NEON Intervention is a web-based intervention that includes almost 700 diverse mental health recovery narratives within its narrative collection. The NEON Intervention was developed to support people in their recovery from mental health difficulties. A process evaluation has characterised the experience of engaging with the NEON Intervention in two clinical trials: the NEON Trial (experience of self-rated psychosis, ISRCTN11152837); the NEON-O Trial (experience of non-psychosis mental health problems, ISRCTN63197153). The process evaluation documented how the NEON Intervention was appropriated, i.e., used and integrated into the everyday life of individuals who found it beneficial.

## OBJECTIVES

To assess trial participants' perceptions of the online NEON Intervention, and how it was appropriated

## METHODS

Semi-structured interviews were conducted with 54 NEON Trial and NEON-O Trial participants. The topic guide supported participants to reflect on their year-long experience of accessing the NEON Collection through the NEON Intervention. Interviews were analysed using inductive thematic analysis in NVivo. The analyst team included people with lived experience of mental health distress.

## RESULTS

NEON was described as a "safe place" for users to access and interact with recovery narratives. The intervention was utilised as an alternative recovery resource when individuals wanted to access non-pharmaceutical options to aid their recovery. However, it was also used as a final resort when individuals lacked access to formal support due to service rationing. Some users avoided the use of NEON during periods of experiencing mental health difficulties, to avoid triggering further distress. However, many participants used the intervention more during periods of distress to improve their mental well-being. NEON was appropriated into the daily lives of users when it was perceived beneficial, with some users accessing hundreds of narratives and using it almost daily. This includes using NEON as a distraction tool, where users used it to distract themselves from negative thoughts and emotions. NEON was utilised by some as a boost to their emotions,

and attain positive affects such as hope and inspiration. Some users described feeling connected to the narrators of the recovery narrative, and that this led to a feeling a part of a large support network, even though the NEON Intervention had no mechanism for communicating with narrators. Most participants could identify the characteristics of a desired recovery collection, which was often described as having relatable, “brave”, and authentic narratives. Authenticity of narratives was judged based on whether narratives engaged with the complex reality of mental health difficulties. Being presented with a large and diverse collection of recovery narratives made it easier for a participant to compare their own story to others, to find a variety of experiences, and to access minority perspectives.

#### CONCLUSIONS

Users actively integrate web-based recovery interventions can be actively integrated into the daily lives of individuals when its content is relevant and relatable. Providing access to recovery narratives might attend to users’ evolving perceptions of the ideal narrative collection. Overall, online recovery interventions can provide beneficial support to users when other formal mental health services are overwhelmed or are avoided.

## **Session: Digital interventions**

# **Personalisation and Recommendation for Mental Health Apps: A Scoping Review**

Clemence Rhodes-Maquaire[1], Paul Matthews[1]

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**Corresponding author:** Clemence Rhodes-Maquaire

**Keywords:** Digital mental health, mental health, personalisation, recommender systems, applications, review

A large number of digital mental health (DMH) mobile apps exist to help people with specific mental health issues or general wellbeing, and the market is set to grow. Apps can fulfil a need for people unable or unwilling to access face-to-face support or whose symptoms are milder. The problem of low engagement and attrition amongst DMH app users remains common, with many abandoning them before they can really help in improving mental wellness. Personalisation, defined as interventions that are tailored to consumers' personal preference, is seen as one possible route for improving engagement. The logic has it that, with more personalised services, features and touch points, people will be more likely to persist with a mobile intervention. When consulted, people often say they would like a personalised approach when using mental health apps. Although many apps describe themselves as offering personalised features there is a lack of evidence about the quality and level of personalisation and it quite often not as extensive as described.

The core objective of this study was to review evidence from published primary research documenting the development and evaluation of mental health apps with personalisation/recommendation features in order to investigate the contribution of personalisation to engagement and effectiveness. Research papers from different databases were retrieved using keywords that included mental health and personalisation or recommender systems. Initially 95 papers were retrieved to be read in full to further eliminate irrelevant papers which left with a total of 47 eligible articles being found.

The preliminary results suggest that the DMH systems described in the majority of the eligible articles have relatively weak personalisation with many being coded as "user targeting" (gathering of user preferences or conditions within limited categories being used to initialise the system) . The articles included more quantitative style studies with many using clinically valid scales when evaluating the effectiveness of the personalisation. Many of the articles had an intervention and control group for the studies being conducted with the control often having no access to the app. We find it hard however to determine the extent to which personalisation improves mental wellbeing without another participant group using a non-personalised version. For those that included their data, Hedge's *g* was performed to look at the effect sizes of the articles, with many showing a small effect, suggesting little difference to those found in systematic reviews of non-personalised apps.

Our review suggests there is mixed evidence on the performance of personalisation/recommendation within the DMH apps described, but with some suggestion that the stronger personalisation techniques support the use of personalisation. Overall, there is a lack of good quality evidence to isolate the effectiveness of personalisation within mental health apps. We conclude by identifying gaps and opportunities for better evaluation as well as more sophisticated and "stronger" methods of DMH personalisation.

## **Session: Digital interventions**

# **Digital tools for mental wellbeing intervention**

Fiona Hegarty [1], Thomas J. Naughton [1], Liadh Kelly [1]

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**Corresponding author:** Fiona Hegarty

**Keywords:** Mental Wellbeing, Mood, Wearables, Mobile Device, Sleep, Activity

Mental health is of serious global concern. Young adults are a demographic where mental health and wellbeing has been found to be in a state of crisis. In a recent survey of c. 8300 young adults in the age range of 18 -25 years, the “My World Survey 2” (1) study carried out by the UCD School of Psychology and Jigsaw in Ireland, found that 43% of young adults surveyed had moderate to very severe depression and 49% had moderate to very severe anxiety. Of these 23% were in the severe and very severe categories for depression and 28% in the severe and very severe categories for anxiety.

Young adults are highly technically literate and as such particularly well suited to digital mental health and wellbeing solutions. Everyday devices such as smart mobile phones and fitness wearables provide a significant opportunity to track relevant aspects of their daily lived experience. Aspects of both sleep and physical activity are known to impact mental health, and both can be easily controlled and adjusted. Existing research has shown sleep variables such as quality, quantity, and variance to be correlated with mental health. Sleep disruption, getting too much or too little sleep or having an irregular sleep routine have all been linked with mental health issues. Existing research also indicates that physical exercise or lack thereof have been shown to be an important contributor to mental health and taking regular exercise may even have a protective effect. Both sleep and physical activity can be easily collected from a fitness wearable and analysed along with regular mental wellbeing self-reports on a mobile phone to better understand the exact nature of their relationship with mental health.

My PhD research area focuses on the use of digital tools for mental wellbeing intervention. I propose to investigate the relationship between sleep and physical activity on mental wellbeing, specifically mood. I am currently designing a study to collect the relevant sleep and activity data metrics. The physical activity and sleep data will be captured from a wearable device, a smart watch. A mobile application running on the Android platform will capture self-reported mental wellbeing and mood related survey responses in the wild. Statistical and machine learning techniques will then be applied to the data with the aim of better understanding key contributory factors associated with changes in mood and mental wellbeing over time. The target demographic for this research is the young adult population, for which purpose we will be recruiting volunteers from the Maynooth University student population.

Ref:

1. Dooley, B et al, “My World Survey 2, The National Study of Youth Mental Health in Ireland”, [http://www.myworldsurvey.ie/content/docs/My\\_World\\_Survey\\_2012\\_Online.pdf](http://www.myworldsurvey.ie/content/docs/My_World_Survey_2012_Online.pdf)

**Session: MENHIR workshop - Conversational systems for mental health & NLP**

## **Assessing user retention in a longitudinal digital mental health data collection study to develop vocal biomarkers**

Philip Donaghy [1] , Maurice Mulvenna [1], Edel Ennis [2] , Niamh Kennedy [2] , Raymond Bond [1]

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**Corresponding author:** Philip Donaghy

**Keywords:** Machine Learning, Voice Biomarkers, Depression, Anxiety, Speech, Mental Health, Artificial Intelligence

This abstract reports findings on user engagement from a study carried out to collect digital speech and scale data that could be used to develop novel voice biomarkers. The data is collected using an app-based tool that is used in the community. The study population were young people (16-24) recruited from the community using schools, mental health charities, Ulster University, and social media to reach the general public. The study design was longitudinal, lasting 12 weeks. Over 500 young people were recruited, with around 400 users completing the first mental health scale assessment. The young people completed three mental health scales, alongside two voice assessments. The participants completed the Patient Healthcare Questionnaire-9 (PHQ-9), which assesses major depressive disorder (MDD), the Generalized Anxiety Disorder-7 (GAD-7) which assesses anxiety and the DSM-5 cross cutting symptom measure, which assesses a broad spectrum of mental health conditions. The DSM-5 scale was of particular interest because it assesses a broad spectrum of mental health conditions and somatic symptoms including pain, memory, and substance misuse.

For the voice assessment, the participants were asked to read Aesop's fable "The North Wind and the Sun" (which takes 1 minute). This text is commonly used in voice assessments both in voice biomarker studies and in the field of linguistics due to its range of phonemes. A second question collected 40 seconds of spontaneous voice data using the prompt "How has your day been?"

At the outset, participants provided mental health information including any diagnosed mental disorders, whether they consider themselves to have good mental health or not, and any use of relevant medications. Demographic data including age group, education or employment status, and sex and gender identity was also collected.

Initial engagement and adherence based on factors such as diagnosed disorders, mental health scale scores, age group, and education / employment status were analysed. These results have implications for app-based assessments of mental health and studies using accessible app-based assessments in the community.



**Session: MENHIR workshop - Conversational systems for mental health & NLP**

## **Usability analysis of a mental health and wellbeing chatbot, and the association between usability and perceived effectiveness**

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**Corresponding author:** Frederick Booth

**Keywords:** mental health, chatbots, Mental health professionals, conversational user interfaces, mental health and wellbeing

In this study we examine the usability of a mental wellbeing chatbot called ChatPal, which was developed in collaboration between universities and mental health charities based on the concept of positive psychology. Volunteers were recruited to trial the chatbot over a period of twelve weeks and were then requested to complete a survey on the usability of the application. The survey consisted of twelve statements with responses using the Likert scale with a free text area for other feedback.

A total of 131 completed surveys were recorded and analysis of the results show that while 38% of participants found the chatbot realistic and engaging, 36% did not. When questioned regarding whether they felt the chatbot was too robotic, 43% agreed with this characterisation while 33% did not agree. Almost half felt that the chatbot was not welcoming during the initial set up with 54% indicating that they felt that the bot seemed unfriendly whilst interacting with it. Opinions were also split on understanding the purpose of the chatbot with 48% indicating that it did not explain its scope and purpose well (40% felt that it did) and 53% indicating that it gave no indication as to its purpose (38% disagreed). Even though 40% felt that it was easy to navigate the menu system, the same proportion of participants felt that it was easy to get confused when using it. A quarter of participants felt that not only could the chatbot not cope well with errors, but it was unable to handle them, which likely points to the challenge of handling free text. When questioned on how useful they thought the chatbot was for supporting mental wellbeing, over 74% felt that it was useful and only 15% disagreed. As for how much they believed the chatbot had changed their mental wellbeing, over 54% felt that it had improved their mental well-being with almost 6% feeling that it had a detrimental effect. A strong correlation was found between how useful participants felt the chatbot was for supporting mental health and their perception of the improvement in their own mental well-being ( $r=.74$ ).

The results show a split in opinions as to the usability of the ChatPal chatbot. The results indicate the challenge of designing the chatbot's 'personality', purpose and ease of navigation. Studies have shown that chatbots exhibiting high levels of conversational skill are more likely to be adopted by users than those with lower skill levels. People perceive a more skilled chatbot to be more socially present and anthropomorphic than a less skilled one. As ChatPal is essentially a menu driven chatbot, it was perceived to be robotic. Despite the technical limitations of the chatbot, the majority of participants felt that it was useful for supporting their mental wellbeing with over a half responding that it had a positive effect on it.

Acknowledgements

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**Session: MENHIR workshop - Conversational systems for mental health & NLP**

## **Awareness and views of healthcare professionals towards mental health chatbots**

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**Keywords:** chatbots, mental health and wellbeing, survey, healthcare professionals, mental health professionals

Digital technologies such as chatbots are becoming increasingly popular in mental health. Trust is an important consideration for the adoption of technology in the mental health domain, as health professionals must be confident in their recommendations to clients. Thus, the aim of this study is to explore views of healthcare professionals towards the use of mental health chatbots.

Mental healthcare professionals (n=218) were surveyed about their awareness, attitudes, and practices relating to chatbots. Answers to survey questions were compared pre-covid (n=131, responses collected before 12th March 2020) to active/ post-covid (n=87, responses collected from 12th March 2020 onwards).

Healthcare professionals were asked if they believed their clients used mental health chatbots. One quarter said yes (23%), one third said no (32%) and others were unsure. Answers to this question were similar throughout the duration of the survey, with no statistically significant difference in answers pre-covid compared to active/ post-covid ( $W=3553$ ,  $p=0.85$ ). Healthcare professionals had more personal experience with chatbots for physical health (18%) compared to mental health (9%). Pre-covid, 15% of healthcare professionals had used chatbots for physical health and 6% had used mental health chatbots, while post covid these figures rose to 22% and 14% however these increases were not statistically significant for physical health ( $\chi^2=1.04$ ,  $df=1$ ,  $p=0.31$ ) and mental health ( $\chi^2=2.21$ ,  $df=1$ ,  $p=0.13$ ) respectively. Overall, the majority (74%) of professionals believed that chatbots are very or somewhat important in mental health care, while the remaining 26% felt they are somewhat or not very important. Comparing pre-covid to active/post-covid, the percentage of those who thought chatbots were very or somewhat important rose from 73% to 77%, however this change was not statistically significant ( $W=3470$ ,  $p=0.66$ ).

Healthcare professionals were asked how often they recommend apps to a client. Pre-covid, the responses were; 3% very frequently, 14% frequently, 47% sometimes, 36% never. In comparison, active/post-covid responses were statistically significantly different ( $W=4693$ ,  $p=0.039$ ), favouring more positive responses; 6% very frequently, 15% frequently, 60% sometimes, 19% never.

When asked if professionals would be likely to prescribe chatbots to clients in the next 5 years, one fifth of participants said they would be very likely, just over half said they would be somewhat likely, and a quarter thought they would be somewhat or very unlikely. The likelihood of professionals to prescribe these technologies did not change throughout the duration of the study.

Anxiety, depression and stress were the top three disorders in which >70% healthcare professionals thought chatbots had some or significant potential to target, both pre-covid and active/post-covid. Conversely,

healthcare professionals thought that there would be potentially more problems with chatbots for dementia and schizophrenia.

Overall, perceptions were generally positive, and support was greatest for chatbots that target stress, anxiety and/or depression. Attitudes towards the use of mental health chatbots are shifting, however confidence in prescribing these technologies is not quite there yet. It is important to target chatbots at the use cases professionals endorse. Future work should look at building up the evidence base in support of mental health chatbots.

**Session: MENHIR workshop - Conversational systems for mental health & NLP**

## **Exploring the Influence of the Design of Counseling Chatbots on Counseling Outcomes**

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**Keywords:** chatbots, counseling, Psychotherapy

Chatbots, sometimes called conversational agents, regularly automate services by conversing with people and answering questions. This has made chatbots popular in healthcare, consumer services, and education. It is estimated that the rapidly growing chatbot market will reach 1.23 billion US dollars by 2025. As chatbots proliferate, so do their human interactions. In fact, at the time of writing, up to 30% of internet conversations include chatbots. Due to the expanding amount of human–chatbot interaction, user experiences are increasingly bound up with how well chatbots’ function and perform.

Research has shown that individuals consider chatbots as social actors and may unconsciously assign chatbots personalities. This has inspired researchers to design counseling and advising chatbots that help users with various inquiries and problems. Examples include academic, therapeutic, and mental health advising. Not only do the designers of advising chatbots incorporate usability and task efficiency into the chatbot design, but the intentional textual and non-verbal cues that contribute to the expression of personality can also be engineered.

Recently, In the realm of psychological health, there has been an increasing interest in chatbots with counseling functions. Existing research indicates that counseling/psychotherapeutic outcomes may differ based on incorporating human qualities into the design of the counseling chatbot. As such, researchers have examined the influence of chatbot design on counselee/client behavior and experience evaluation. Indeed, evidence shows that the anthropomorphization of chatbots plays a significant role in enhancing the chatbot-counselee interaction. For example, researchers have examined how interviewer chatbots’ personalities affected human interviewees’ sentiments and discovered that participants’ attributes determined their preferred chatbot type. Another recent study assessed the impact of a counseling chatbot’s gender, personality, and visual interface cues on user self-disclosure and companionship.

Given the evidence for the effect of counseling chatbot design on counseling outcomes, this scoping review aims to identify the common design features for counseling chatbots that lead to better counseling outcomes. This review provides a framework of evidence-based principles to guide designers when developing chatbots that will perform a mental health counseling function.

**Session: MENHIR workshop - Conversational systems for mental health & NLP**

## **Maternal Mental Health Monitoring in an Online Community: A Natural Language Processing Approach**

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**Keywords:** pregnancy app, mental health monitoring, maternity, natural language processing, machine learning, peer support

The digital forms of social support present a potential solution to the maternal mental health issues at a large scale, thanks to the advancement of digital technologies. As a result, maternity support web applications have gained global popularity in recent years. Their users are often grouped by a similar expected due date to facilitate their exchange of personal experiences and knowledge about maternal caring during pregnancy. A user can exchange information in the peer groups by either initiating a post or responding to a post. However, a post is not always asking a question (i.e., seeking support) but rather can be non-support-seeking such as sharing personal experience. Therefore, it is important to differentiate between support-seeking posts and non-support-seeking ones as a first step to monitor maternal mental health in such digital platforms. To do so, we apply natural language processing methods to the data collected from one of the largest Chinese maternity and parenting web applications (Jiang and Zhu, 2022a, 2022b). We collected 52,558 posts from the web application, from which we randomly sampled and labelled 3,000 posts as either support-seeking or non-support-seeking. We choose four machine learning algorithms, including logistic regression, decision tree, random forests and naïve Bayes, to classify the posts. We find that naïve Bayes models perform the best in terms of AUC scores. We also find that our manually trained models outperform other third-party NLP sentiment analysis packages or dictionary-based models. Our results allow maternal mental health monitoring throughout the pregnancy cycle as well as at the individual level. We also discuss the implications for providing timely maternal mental health support and early interventions in such digital platforms.

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**Session: MENHIR workshop - Conversational systems for mental health & NLP**

## **Harmony: A global platform for contextual harmonization, translation and cooperation in mental health research**

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**Keywords:** mental health scales, AI, natural language processing, survey data

Mental health problems are a growing global public health concern. One of the main barriers to understanding the prevalence, antecedents, and outcomes of mental ill-health around the globe is a lack of comparable data, particularly from low-income countries. Although there are increased efforts at data discoverability (Health Data Research UK, 2022), studies can vary widely in terms of the questionnaires or instruments used to measure mental ill-health. One approach for addressing this is retrospective harmonisation, the process by which data from two or more existing studies are modified to make them directly comparable (McElroy, et al., 2020). When dealing with mental health questionnaires, harmonisation typically relies on expert opinion to identify subsets of questions that capture the same symptoms – a process is time consuming, open to bias, and lacks reproducibility.

In this paper, we introduce Harmony, an open-source, multi-lingual, online harmonization tool that uses natural language processing to identify and quantify the semantic similarity of questions across different instruments. Harmony, matches items using a transformer neural network (Reimers & Gurevych, 2019), allowing researchers to construct harmonized subscales for direct comparisons across data sets. We detail the development of Harmony and explore how it performs in comparison with expert-opinion based harmonization.

## Session: MENHIR workshop - Conversational systems for mental health & NLP

# Findings from a textual analysis of the MENHIR conversational corpus

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**Keywords:** anxiety, depression, textual analysis, natural language processing

**Introduction:** As part of the MENHIR project, a corpus of voice recordings of interviews between counsellors and 60 subjects was collected. The subjects belonged to two groups: an experimental group of 32 subjects with a diagnosis of anxiety or mild depression and a control group of 28 subjects with little or no mental illness. The audios manually transcribed, user turns were defined and temporally aligned and filled and empty pauses were annotated.

**Methods:** We have performed an automated analysis of the transcripts of the MENHIR corpus computing information about the number of turns in each conversation, average turn duration, frequency and duration of empty and filled pauses, word rate, richness of vocabulary, sentiment polarity, most frequent words and part-of-speech use. To study the vocabulary, we performed stemming and removal of stop words. After obtaining the results, an ANOVA test was performed to discern whether the differences encountered were significant.

**Results:** Our results show a significant difference between the two groups in several aspects. The experimental group had a significantly higher frequency of turns in their conversations. The frequency and average duration of pauses also differed significantly. This was mainly due to the frequency and duration of empty pauses, much higher in the experimental group. The use of filled pauses was not significantly different between the two groups.

The average sentiment of the sentences was also different. Negative polarity was significantly more present in the experimental group. Although more positive sentences were uttered in the control group, the difference was not significant.

Users in the experimental group showed a significantly richer vocabulary with a higher number of different words per conversation. When computing the list of the most frequent words used by each group, there were many coincidences. However, among the words that were only used by the experimental group and not present in the control group, there are terms like thought, mood, achievement, confidence, horizon, tomorrow, dark, anxiety, or depression. In contrast, when examining the words employed by the control group that were not used by the experimental group, there appear terms such as sunny, optimistic, loved, relationship, or normal.

With respect to the grammatical roles of the words, the part-of-speech analysis revealed that the experimental group employs significantly less adjectives adverbs, and nouns; while they employ significantly more conjunctions, numerals and specially pronouns and verbs. The case of pronouns is particularly relevant, especially for first person singular and third person plural.



Conclusions: Textual analysis of conversation transcripts can obtain relevant features that may indicate potential anxiety or mild depression. Some of them are consistent with the literature (e.g. the use of first person pronouns, richness of vocabulary), while others show interesting novel indicators such as turn-taking behaviour or positive terms use.

There is a relevant difference in the average age of both groups in the MENHIR corpus that may affect how users expressed themselves (e.g. the vocabulary chosen), and in turn, the results of the analysis. To mitigate this limitation, we plan to replicate the experiments with additional corpora.

**Session: Virtual reality & gaming**

## **Virtual reality (VR) game for the relaxation and expressive experiences of older adults**

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**Keywords:** virtual reality, gamification, older adults, wellbeing

### Introduction:

This session presents the design and evaluation of a virtual reality (VR) serious game for older adults' relaxation, expression, cognitive and life skills training. The home-like virtual environment consist of six different rooms, each involving a mini-game targeting a specific type of leisure activity comprising drawing, music appreciation, swimming gardening, kitchen and bathroom cleaning. Accessibility design, such as the use of button-less controllers, is incorporated to ensure the older adults can engage in the VR gaming experience without barriers.

### Methods:

Fifteen older adults (M = 8, F = 7) aged between 65 and 80 were invited to play the VR game and evaluate its effectiveness. They were guided to explore and play the VR game for 20 minutes, followed by a semi-structured interview asking for their acceptance to VR gaming, difficulties encountered, quality of relaxation and expressive experience.

### Results:

Participants affirmed their acceptance of the VR technology and gaming experience, finding both enjoyable and, in the case of the former, easy to handle. They felt satisfaction and a sense of achievement created by the virtual spaces. The realistic simulation of familiar environments provided the participants with an alternative means of engaging in and benefitting from leisure activities through a gamified approach. Suggestions for improvement included the autonomy for the players to take more active roles in the gaming tasks, provision of opportunities to relay their thoughts on the usefulness of the gameplay, and ensuring a smooth learning curve for them in overcoming the hurdles of manipulating VR technology. More accessible designs are desirable for improving ease of use, thereby enabling older adults to overcome the hurdles of manipulating emerging technology, alongside presenting them with opportunities to fully appreciate the usefulness of gameplay.

### Conclusions:

Findings of the evaluative study affirmed the feasibility of VR game as a digital solution to help support the mental health and well-being of older adults.

**Session: Virtual reality & gaming**

## **Adapting Exposure Therapy for Public Speaking Anxiety, the use of 360° Video Virtual Reality**

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**Keywords:** Virtual Reality

**Introduction:** Public speaking anxiety (PSA) is a prevalent condition which is highly interrelated with social anxiety. Exposure therapy is efficacious in significantly reducing PSA symptomatology. Due to constraints inherent to traditional exposure therapy which is conducted in-vivo, Virtual reality exposure therapy (VRET) is increasingly being explored as a novel mode of treatment. Research to date has primarily utilised VR incorporating computer generated images (CGI). However, CGI can be limited by low representational quality and 360°video VR may be more realistic.

**Methods:** This randomized controlled trial compared a 360°video VRET intervention in multiple comparison groups to gauge its efficacy on PSA and interrelated disorder relevant fears. The study also explored whether video content impacted upon intervention outcomes, by comparing a '360°Audience' group utilising stimuli incorporating real-life audience members and a '360°Empty' group utilising stimuli of real-life empty rooms. Participants with high PSA ( $n = 51$ ) were randomized to: 360°Audience ( $n = 17$ ), 360°Empty ( $n = 16$ ) and no treatment control ( $n = 18$ ). Outcomes were measured over five time-points.

**Results:** Mixed ANOVA revealed a significant interaction between time and intervention group for PSA, social anxiety and fear of negative evaluation (FNE). Within-group analysis demonstrated there was a significant pre-intervention to post-intervention reduction across measures for both 360° video VRET groups: PSA 360°Audience ( $\eta^2 = .90$ ,  $p < .001$ ), 360°Empty ( $\eta^2 = .71$ ,  $p < .001$ ); social anxiety 360°Audience ( $\eta^2 = .49$ ,  $p = .002$ ), 360°Empty ( $\eta^2 = .39$ ,  $p = .009$ ); FNE 360°Audience ( $\eta^2 = .59$ ,  $p < .001$ ), 360°Empty ( $\eta^2 = .43$ ,  $p = .006$ ). 360°Audience and 360°Empty participants showed significant improvement from pre-intervention to 10-week follow-up on all measures.

**Conclusions:** Findings illustrate that 360°video VRET is an efficacious way to significantly reduce PSA, social anxiety and FNE. Media content emerged as important, as exposure to fearful stimuli (audiences) resulted in greater reductions in anxiety for participants than exposure to empty rooms. As 360°video VRET offers a novel and cost-effective method of exposing participants to situations which can be inaccessible and impractical in-vivo, its use should be considered in clinical practice settings.

**Session: Virtual reality & gaming**

## **The Metachurch: How Might the Metaverse Impact Religious Practice**

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**Keywords:** Religion, Social Identity, Wellbeing, Metaverse, VR, XR

The term metaverse first appears in the Neal Stephenson novel Snow Crash. Stephenson uses the term to describe a persistent virtual world, a successor to the internet, populated by millions of people in digital avatar form. This fictional virtual reality features places of work (offices), rest (homes) and play (nightclubs), where people meaningfully interact with each other across an expansive digital ecosystem. This fictional envisioning of a metaverse resembles its emerging factual counterpart. This embryonic idea, the metaverse, is heralded as the 3D web, Web 3.0 and the next phase in the evolution of the mobile internet. Also aligned with Stephenson's vision, the proposed use of immersive technologies, such as virtual and augmented reality, will result in interconnected virtual environments where people and computer-generated characters, in avatar form, purposefully interact.

Conceptually the metaverse remains embryonic, it is an idea that is still forming, still unfolding. There is, however, consensus that the metaverse will be an interconnected virtual universe (many virtual worlds) – a digital ecosystem - where humanity can congregate in digital avatar form to work, study, shop and socialize. This is where the internet meets immersive technologies, such as virtual, augmented and mixed reality (XR). Such a convergence of existing technologies (all the elements are in place) will have implications for well-being, positive and negative.

Much of the prognostication about the implications of the metaverse centre on secular activities. For example, retail, entertainment (gaming/concerts) and social networking. Little attention has been given to how the metaverse might impact religion. This presentation, a scoping review, will explore contemporary research into online religious practice and the use of immersive digital technologies for religious purposes. This focus informs a discussion about how the metaverse, an online and immersive technology, might impact religion/religious practices. For billions of people worldwide, religion is an essential aspect of social identity and a cornerstone of psychological wellbeing. The emergence of the metaverse may represent a new way of connecting with an ancient source of human flourishing. Conversely, the same elements that will make online religion more engaging, can be leveraged by exploitative and extremist factions. Future research might also consider interpersonally exploitative (cultish) aspects of digitally mediated faith-based activity.

**Session: Virtual reality & gaming**

## **Exploration of Gaming Disorder Across 30 Nations**

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**Keywords:** Gaming Disorder, Culture, Mental Health

Ratified on May 25th, 2019, the 11th edition of International Classification of Disease (ICD-11) included, for the first time, Gaming Disorder. The diagnosis is appropriate for anyone who, for 12 months or more, has lost control of their gaming habits. Indicators include routinely putting gaming ahead of other social and occupational priorities, despite adverse consequences. The full diagnostic criteria for gaming disorder (online and offline) are listed in the ICD-11 in the section titled: Disorders due to addictive behaviours. The American Psychiatric Association (APA) has also identified gaming disorder (Internet Gaming Disorder) as a condition for further study and possible inclusion in future revisions of the Diagnostic and Statistical Manual of Mental Disorders. Previous research suggests that gaming disorder prevalence varies greatly between nations and world regions. Much of the multinational comparative research, however, relies upon analysis of pooled studies within the context of metanalytic reviews. Very little research has compared international gaming disorder prevalence within the same cross-sectional study, using common timeframes, samples and measures. The present study addresses this gap by using data from Ithra's 2021 global digital wellbeing survey to explore gaming disorder and its socio-demographic correlates across 30 countries. Participants (N = 15,000) were representative adult samples (N = 500) drawn from 30 nations. All participants provided socio-demographic data and completed a measure of gaming disorder symptomatology. Gaming disorder prevalence varied significantly between nations. Regression analysis identified several correlates/predictors of gaming disorder status, including age and gender. Even after controlling for demographic variables, marked levels nation-level variability in gaming disorder remained. Asian and Middle Eastern nations (India, China, Turkey, UAE, Egypt) were at the high end, while South American nations (Columbia, Brazil, Argentina, Mexico) at the low end of the gaming disorder prevalence spectrum. Possible mechanisms for this nation-level variability are discussed. These findings can help inform public health policy initiatives to reduce and prevent gaming disorder.

## Session: Data science and AI

# Patient-Generated Real World Data Collected from Digital Health Technologies: The “30,000-Foot View” of the Evidence Across Years, Conditions, and Geography

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**Keywords:** Real world evidence; real world data; digital tools; digital health; digital biomarkers; patient-generated health data; mHealth; wearables

**Introduction:** Digital health technology (DHT) advancements have unlocked new channels for remote care delivery and monitoring; while the use of DHTs as interventions has been more extensively reviewed, the critical need was identified to comprehensively map the evidence when it comes to their use for measuring patient outcomes in the real world. We conducted a scoping review to investigate the use of DHTs for measuring real-world clinical outcomes using patient-generated data.

**Methods:** This systematic scoping review used Joanna Briggs Institute (JBI) methodology and a pre-defined strategy to search the following included databases: MEDLINE (Ovid), CINAHL, Cochrane (CENTRAL), Embase, PsycINFO, ClinicalTrials.gov, and the EU Clinical Trials Register. We considered studies with passive and/or active data collection from DHTs used by patients with any specified health condition outside of clinical visits. After screening and full-text review, data were extracted and analyzed using predefined fields, and findings were reported in accordance with the PRISMA-ScR.

**Results:** A total of 11,015 publications were identified from the search strategy, and after de-duplication, screening and full text review, 510 studies were included for extraction. These studies covered 169 different diseases and conditions over 20 therapeutic areas and 44 countries. DHTs used for mental health and addictions research (n = 111) were most prevalent and the findings for this therapeutic area will be prioritized for this presentation. In addition to providing insights on the different types of data collected by DHTs today (e.g., physiological, behavioural, clinical symptoms, etc.), the inter-relationships between data types collected by the same digital tools will be presented through novel data visualizations.

**Conclusions:** Within this growing body of evidence, our research provides an exhaustive look at the diverse applications of DHT (including smartphone applications, wearables, implantables, and other sensors) and advanced analytics to collect real-world data that can be used to diagnose disease, characterize health status, and predict health outcomes. This presentation will offer audience members across the digital mental health ecosystem a view to the current opportunities for DHT-enabled clinical outcome measurement and the remaining research gaps in patient-generated health data.

## Session: Data science and AI

# The app features that are linked to the quality scores and user ratings of mental health apps: a machine learning approach

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**Keywords:** Mental health apps quality assessment, mental health apps' features

**Introduction:** There has been a rapid increase in demand for mental health services (in part due to COVID-19). Currently, there are over 10,000 mental health apps available in the app stores. The Organisation for the Review of Care and Health Applications (ORCHA) is a United Kingdom based digital health compliance company that specialises in the assessment of digital health apps' quality (quality defined as "compliance with best practice standards"). For mental health apps to be recommended to the users by health professionals, they must be of sufficient quality, and some features such as 'goal setting and gamification' may be linked to better quality mental health apps. The objective of this study was to identify the common features within mental health apps and to determine which features are linked to quality scores and user ratings.

**Methods:** R language and R studio has been used to conduct inferential statistics and generate results. Random forest and Boruta feature selection methods have been used to identify the app features that are important for predicting user ratings as well as ORCHA quality scores in the areas of user experience, professional/clinical assurance, data privacy and overall aggregate ORCHA quality score. All scores are on 0–100 point scale and user rating from 1–5 star scale. Shapiro-Wilk test was used to check for normality and Wilcoxon rank sum test was used to compare scores' distributions with  $P\text{-value} < .05$  considered statistically significant.

**Results:** Out of 552 mental health apps (116 apps with both Android and iOS versions counted), the five most common features were: 'Information provision' ( $n= 548$ ), 'Data capture' ( $n=546$ ), 'Data sharing' ( $n=528$ ), 'Health monitoring' ( $n=274$ ) and 'Goal setting & gamification' ( $n=230$ ). 'Service signposting' ( $n=221$ ) followed by 'Goal setting & gamification' has been identified as the most important features for predicting the ORCHA score and user rating, according to random forest and Boruta feature selection methods. ORCHA score for 552 and user rating for 479 (unrated apps removed) mental health apps was not normally distributed. Apps that had 'Service signposting' or 'Goal setting & gamification' feature had higher ORCHA scores than those without (median increase of 8 points and 8.5 points respectively). Wilcoxon rank sum test confirms that the difference in distribution is statistically significant for both  $P < .001$ . For user rating ( $n=479$ ) apps that had 'Service signposting' feature had a decrease of .11 stars and  $P\text{-value}$  of .002 while 'Goal setting & gamification' increase of .06 stars with  $P\text{-value}$  of .20.

**Conclusions:** This study shows that the 'Service signposting' and 'Goal setting & gamification' features are positively linked to ORCHA score. For user rating feature 'Service signposting' has been negatively linked to

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ORCHA score, achieving statistical significance and 'Goal setting & gamification' was positively linked to ORCHA score, but didn't achieve statistical significance. Nevertheless, the use of 'Service signposting' and 'Goal setting & gamification' features are encouraged for mental health apps due to improvements in overall quality.



## Session: Data science and AI

# A multivariate exploratory data analysis of a crisis text messaging service to measure the impact of the COVID-19 pandemic on mental health in Ireland

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**Keywords:** Digital Mental Health, Data Analysis, Pandemic, Text-50808, Linear Regression Modelling

### Introduction

A range of public health non-pharmaceutical intervention (NPI) strategies were implemented in the year 2020 and 2021 to mitigate the transmission of COVID-19. The drastic changes in everyday life due to lockdowns had the potential for a significant negative impact on public mental health, and a key public health goal is to now assess the evidence from available Irish datasets to provide useful insights on this issue. Text-50808 is an online text-based mental health support service in Ireland. Its dataset can provide a measure of revealed distress and mental health concerns across the population. The aim of this study is to explore statistical associations between public mental health in Ireland and the COVID-19 pandemic, through several statistical analyses.

### Methods and Findings

Linear regression modelling is performed to find the topics discussed at Text50808 that are the most significant predictors of the overall chat volumes at Text-50808. COVID-19 related chats are found to be the most important and significant predictors of overall daily chat volumes at Text-50808.

A further exploratory study is presented to analyse the frequency of helpline conversations during different NPI phases in Ireland. The stringency index is a composite score of 9 response indicators including school closures, workplace, closures, travel bans, etc. Interestingly, no direct cross correlation is found between stringency index and daily chat volumes at Text-50808. However, the sudden peaks in text volume at Text-50808 immediately prior to new restrictions in Ireland indicate an association between a sudden rise in mental health concerns following the announcement of the new restrictions. This analysis is extended by applying segmented breakpoint modelling via breakpoint regression with multiple turning points, to identify the structural breaks across COVID-19 related chat volumes at Text-50808. Seven distinct breakpoints were identified through breakpoint regression analysis, which co-occurred with events when considerable changes in NPIs were made in Ireland.

In another statistical analysis, two measures of emotional wellbeing in Ireland are combined: (1) weekly text volume at Text-50808, and (2) emotional wellbeing indicators reported by respondents of the Amárach public opinion survey, carried out on behalf of the Department of Health, Ireland. Associations between study variables and Text-50808 conversations frequency were explored using cross correlation. A significantly high correlation between emotional wellbeing variables in the Amárach dataset and number of weekly texts at COVID-19 related chats at Text-50808 is found. This confirms that Text-50808 reflects overall public sentiment.

#### Conclusion

Pandemics can be highly stressful and challenging times for individuals, families, and communities. The uncertainty, fear, and isolation associated with pandemics can lead to increased levels of anxiety, depression, and other mental health problems. This analysis demonstrates the benefits of the texting service as a community surveillance indicator for mental health in the population. It also suggests that announcements about COVID-19 related NPIs triggered short-lived increases in the number of people contacting crisis text line and reporting a decrease in emotional well-being in Ireland.

**Session: Data science and AI**

## **From Data to Semantic: A New Method for Building Ontologies in Mental Illness Realm**

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**Keywords:** Databases in mental health, ontology learning

Research into mental illness requires the identification of the factors that cause and influence the illness. This is a very active research objective today. The automatic method presented in this work allows an ontology to be extracted from the MDD database for intelligent information retrieval and automatic data analysis. The resulting ontology is a useful support for information management and utilization in mental health.

An ontology allows an accurate understanding of a knowledge domain because it is a highly expressive formal model [1][2]. Ontologies in the medical field also respond to the need for a controlled vocabulary [3][4]. Furthermore, ontologies can dramatically improve collaboration between research groups because they set the framework for interoperability (see, for example, The Open Biomedical Ontologies [5]).

A mental health ontology provides a semantic framework and can play a crucial role in deriving knowledge and helping to prevent, diagnose, treat, and control mental illness. However, building an ontology can be a difficult and time-consuming task.

Ontology learning is a technique that enables the (semi) automatic extraction of ontologies from data (structured, semi-structured, or unstructured). After carefully reviewing the literature on ontology learning for structured data, it became apparent that many of the methods in the literature remained at the prototype stage and were unavailable for use by the community. In other cases, these approaches have yet to be applied to real databases to verify their performance in automatically converting relational databases (RDBs) into ontologies.

In this work, we present a new method for the automatic construction of an ontology from RDB and apply it to a database that collects data from a total sample of 80 subjects aged between 14 and 50 years with a diagnosis of Major Depressive Disorder (MDD) and who have taken one or more medications for at least 16 weeks.

The data in the database are divided as follows:

- Data collected on a one-off basis at the beginning and end of the study (clinical history, socio-demographic indices, environmental parameters, daily habits, and pace of life).
- Data collected at variable frequencies during the trial period (clinical, environmental, and behavioral parameters).

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## Session: Talks from industry & service providers - part 1

# Real-world usage of a digital mental health intervention in the workplace – sector analysis

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**Keywords:** Workplace wellbeing, workplace mental health, digital mental health intervention, wellbeing platform, employee wellbeing, mental health scales, event logs, data analysis, machine learning, chatbots

### Introduction

It is estimated that we spend an average of one hundred thousand hours at work, and while meaningful work can promote good well-being and mental health, over 15% of people in work experience symptoms indicative of a mental health condition. In 2019 to 2020, 17.9 million working days were lost due to work-related stress, depression or anxiety in the United Kingdom. The prevalence of mental health disorders and levels of help-seeking vary amongst employees within different occupational groups and industries. Studies have highlighted the need to focus attention on tailored interventions to address different occupational groups and industry needs, and in particular studies report higher prevalence of depression within male-dominated industries.

Digital mental health interventions can support individuals, in a potentially low cost, efficient and scalable way, where those generalised from clinical settings to the workplace, primarily cognitive behavioural therapy (CBT) stress-management and mindfulness-based stress reduction programs have shown promise. Tailored digital interventions could provide a way to encourage help-seeking within an Employee Assistance Programme, and provide tailored support to different industries and occupational groups.

### Research Questions

In collaboration with Inspire, a mental health social enterprise, the aim of the current study is to analyse real world usage of a digital mental health intervention, the Inspire Support Hub available to employees across different sectors of the workforce.

- How do users from different industry sectors engage with the digital employee wellbeing hub?
- Is the user retention different across the various industry sectors?
- What temporal patterns exist amongst employee engagement with the digital employee wellbeing hub?
- Do users from different industry sectors have different needs in terms of psychoeducational materials and scale use?

### Methodology

The Inspire Support Hub is a web-based platform developed using PHP and MySQL, containing a range of self-help tools. Interactions with the Inspire Support Hub are recorded as anonymous events, including clicks, mood tracks, self-assessment results, with a unique user ID and timestamp. Upon sign up, the user utilises a company pin and their sector is recorded. R studio was used to analyse the event logs collected. R packages dplyr and tidyverse were used for data cleaning and wrangling, and ggplot2 for data visualisation. The

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techniques used to analyse the data include: frequency usage analysis, time series analysis, user archetype discovery, retention/survival analysis.

**Results**

The platform's event logs were analysed between February 2019 and June 2022. During this timeframe several hundred client companies were set up on the platform, across 13 sectors, with 9040 users registering, and 104,621 events were logged.

**Conclusions**

Results from this analysis demonstrate how a digital mental health intervention is used in a real-world setting, across different workplace sectors. These results show how users interact with the same system in different ways, offering actionable insights to provide a more personalised user journey, to improve user experience.

**Session: Talks from industry & service providers - part 2**

## **Building AI responsibly for mental healthcare**

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**Keywords:** Mobile mental healthcare, AI, care in practice, Digital Mental Health

Advances in AI in the last decade have introduced incredible new possibilities for improving the care process. Meanwhile, healthcare rightfully requires strong accountability for all decisions made in the process and involves sensitive information about the people receiving care. In this talk, I will share some insights on what we at NiceDay have been doing over the last few years to responsibly move towards building AI solutions that can be used by professionals beyond a research setting.

## **Session: Talks from industry & service providers - part 2**

# **Digital Mental Health Approaches in remote communities – Outer Hebrides, Scotland**

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**Keywords:** mental wellbeing, digital health, chatbot, online art therapy, anxiety

### Introduction

The Outer Hebrides lies off the NW Scottish coast over 100miles from nearest mainland centre with a population of 26,000. Depression and anxiety are the second and fourth highest causes of ill-health in the Outer Hebrides (Scottish Burden of Disease, 2016) while poor access, small dispersed communities and cultural barriers make mental health service provision challenging. NHS Western Isles were able as partner in 3 EU Interreg projects to explore a number of potential digital mental health solutions.

### Methods

1) ChatPal mental wellbeing chatbot project:

A Co-Design Approach for developing and trialling mental wellbeing chatbot via:

- Mental Health professionals survey
- Stakeholder focus groups
- Co-design workshops
- Trials

2) IT4Anxiety project:

Co-creation of innovative solutions for supporting people with anxiety via:

- International survey of 3000+ people with lived experience, carers and mental health professionals.
- 15 stakeholder focus groups across partner countries
- Solutions hackathons in 5 countries supporting trials of 23 start up innovations

3) mPower Online Arts Therapy (OAT) pilot:

Mixed methods to assess feasibility, acceptability, enablers, experiences and potential benefits of OAT pilot via:

- Online questionnaires to participants and service referrers/therapists
- Padlet – online gallery for capturing participants experiences
- Audio Image Recordings (AIR) structured reflections of participants experiences with therapist
- Focus Groups of referrers/therapists
- Therapist interviews

### Results

Project 1: ChatPal

MH Professionals survey had significant ( $p < 0.01$ ) positive findings with respondents perceiving chatbot mental health benefits (65%), logistical benefits e.g. medicine reminders (80%), improved access (71%) and were likely



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to prescribe in next 5 years (80%). Co-Design workshops developed key elements of chatbot persona that were then tested in trials. In Scottish trial there were both English (n=9) and Scots Gaelic (n=8) versions tested with positive satisfaction ratings. A follow-up study acknowledged the usefulness (3.25) and importance (4.5) of a Gaelic chatbot version.

**Project 2: IT4Anxiety**

Final results due by September 2023. To date 77 Scottish participants in survey (32 persons with anxiety, 9 carers and 36 healthcare professionals).

Part 3: The Outer Hebrides tested Eldom startup photoluminescent signage solution in 9 care homes to 17 residents while supporting three technology startups via its Scottish Hackathon at the UHI Digital Health Centre. These included Kindspace (Emotional support via Alexa voice skill), VRHIVE (VR wellbeing and mindfulness solution) and CERINA (CBT App). Trials support ongoing (Kindspace n=60; Cerina n=90 and VR-HIVE starting usability testing) with results thereafter.

**Project 3: OAT mPower project.**

7 of 8 participants wished to continue use of OAT and prompted enrolment in art activities. Qualitative findings highlighted that this could be an acceptable and feasible intervention pointing in particular to it offering a 'judgement-free zone'. Overall 67% of participants reported benefits including lower anxiety and greater confidence and resilience.

**Conclusion**

The evidence from these 3 projects provides NHSWI with a solid foundation to further build evidence on how Digital Health can overcome the challenges of delivering support in remote communities from the perspectives of people with lived experience of mental ill health, their care-givers and the healthcare professionals.

## Session: Talks from industry & service providers - part 2

# The potential of Klenico as a digital diagnostic tool for improving diagnostic quality in psychotherapy

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**Keywords:** software as a service, digital diagnostics, Klenico, e-mental health

In Europe, the direct costs of mental disorders are estimated at 600 billion euros per year and demand improvement in mental health services.

Studies show that a lack of or non-state-of-the-art diagnostic procedures can account for 44% of treatment failures. Mental health professionals frequently rely on unstructured assessments, which are perceived less time-consuming but pose major problems in terms of validity and reliability. Consequently, comorbidities are often overlooked, and interventions do not follow treatment indications. The discrepancy between recommended and actual diagnostic procedures is large. There is an urgent need for improvement in clinical practice, also taking into account the high time pressure.

The start-up Klenico has developed a web-based diagnostic software as a service to support mental health professionals in daily practice. It covers the entire diagnostic process in a structured fashion and includes most of the mental disorders present in inpatient and outpatient care.

Klenico works in an easy and intuitive fashion. A digital self-report is sent to patients and can easily be filled out at home on a device of their choice. Patients answer 55 screening items and, based on their individual profile, a more detailed self-report follows with up to 495 items. Subsequently, a semi-structured face-to-face or video assessment together with the mental health professionals is conducted. Ratings of both patient and clinician are visualized on a comprehensive symptom map. Finally, Klenico automatically checks whether the diagnostic criteria according to ICD-10 are fulfilled and makes suggestions for diagnoses. Mental health professionals confirm or reject these suggestions. Klenico can also be used for evaluating treatment success by using repeated assessments.

In order to ensure high content validity, Klenico was developed together with international clinical experts. In a study with 115 psychotherapeutic outpatients, it was compared to diagnoses based on semi-structured interviews for DSM-IV. Compared to this diagnostic gold standard, most of the Klenico disorder domains showed significantly higher mean scores for the corresponding diagnosis compared to other diagnoses. A further study used data from 496 inpatients that completed self-reports questionnaires at admission and discharge. Klenico disorder domains revealed high correlations with congruent questionnaires and low associations with divergent questionnaires. Finally, initial exploratory and confirmatory factor analyses support

theory-based factor structures. Sufficient to high internal consistency and sensitivity to change could also be demonstrated.

These initial results support validity and reliability of Klenico and its value as an easy-to-use, time-and cost-saving yet comprehensive diagnostic tool. Overall, it holds great potential for improving diagnostic accuracy in clinical practice.

**Session: Child, youth and student mental health**

**Reporting and specifying the initial implementation strategies used in centralised digital youth mental health care**

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**Keywords:** digital mental health, implementation science, implementation strategies.

Mental health is the primary health issue for youth between the ages of 12 and 25 years. Recent research indicates that the prevalence of mental health difficulties is increasing for young people. Despite increased investment in traditional service delivery, young people and families commonly reporting serious challenges in accessing timely and effective care. Research and policy has drawn attention to the potential of digital health technologies to provide scalable mental health care for young people. While COVID-19 has accelerated the use of digital solutions in health care, youth services continue to struggle to integrate digital offerings into their care pathways.

Mirroring offerings in other jurisdictions, Jigsaw (the national centre for youth mental health in Ireland) has established a central digital clinical team. Recent reviews of digital mental health show few studies report on implementation strategies or outcomes. In order to address this gap, in this paper we set out to describe the initial implementation of this digital mental health service. Firstly, we use pragmatic implementation strategy reporting tool to name and clearly describe different implementation strategies used in the initial implementation of this digital care offering. We then present user data on clinical effectiveness, satisfaction and acceptability. We conclude with recommendations for future implementation approaches in digital youth mental health.

**Session: Child, youth and student mental health**

## **Verbal Wellbeing: A Digital Mental Health App for Improving Wellbeing in Children**

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**Keywords:** Mental health app, children, resilience, wellbeing, schools, mental wellbeing

The first theme of the Northern Ireland Mental Health Strategy 2021-2031 is to promote mental wellbeing, resilience, and good mental health across society. This theme is important in the context of children and young people, who are experiencing delays in receiving mental health care and who lack access to mental health professionals in primary schools. In an attempt to bridge the gap between schools and mental healthcare providers, the Verbal Arts Centre, a registered charity based in Derry~Londonderry which provides bibliotherapy-based interventions to improve mental health and wellbeing, has made children a key beneficiary of its work.

To date, the Verbal Arts Centre has delivered a range of bibliotherapy-based programmes in primary schools that have significantly improved resilience and wellbeing and have been well received by children. However, the reach of these programmes has been limited by factors such as scheduling with schools, the receipt of external funding, and arranging session delivery with volunteers and facilitators.

To address these limitations, to provide more wellbeing programmes to children, and to expand the reach of our wellbeing programmes, the Verbal Wellbeing app was developed. This user-friendly app contains curriculums designed to improve mental wellbeing for children aged 4-11 years, containing both group and individual sessions for children who require further assistance. Curriculums were designed in collaboration with psychologists, literature specialists and parents, and were informed by the Education Authority's Personal Development and Mutual Understanding guidelines. Each curriculum includes stories related to the session's theme, psychology-informed annotations to prompt discussion and reflection, illustrations to focus attention, and activity sheets that reinforce mental health toolkits used in the session's story. The app was designed for teacher use to provide their classrooms with mental health resources and to facilitate discussions around challenging topics such as bullying. The app also contains mood-tracking functionality for teachers to track the wellbeing and progress of their class.

Our aim with the Verbal Wellbeing app is to provide accessible, evidence-based mental health curriculums to schools during a time of school budget cuts, with these curriculums continuing to expand to 2024 onwards. We will outline the ambition behind the app and the potential that it offers to improve the mental health and wellbeing of young people in Northern Ireland and beyond.

## Session: Child, youth and student mental health

# Our Generation app: co-designing a digital intervention engendering resilience and self-awareness in children and young people

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**Keywords:** adverse childhood experiences, mental health, Children & Young People, gamification, app

### Introduction

The effects of Adverse Childhood Experiences (ACEs) and their negative impacts on mental health, self-regulatory capacities, education, employment, and crime are well-known. Therefore, building resilience at a population level has the capacity to reduce the likelihood of several stress-related disorders and, consequently, self-harm. The importance of psychological well-being among Children & Young People (C&YP) is evident from global estimates highlighting 50% of mental health problems are established by age 14 and 75% by age 24.

This paper reports on the literature, design thinking and development stages of a digital app to promote and evaluate evidence-based quality resilience and peace building interventions by engaging C&YP and their key contacts in activities and games that build emotional resilience, self-awareness, and emotional regulation.

### Literature review

The importance of psychological well being among C&YP is evident from global estimates estimating that 1 in 7 (14%) 10-19 year-olds experience mental health conditions, yet these remain largely unrecognised and untreated. Helping C&YP to understand their wellbeing and recognise and manage their own emotions, is an important part of building resilience. Resilience is recognised as an important factor in Trauma Informed Care. Indicators identified from our review of academic literature as contributors to emotional resilience and peacebuilding include:

- Mental Health and Well-being (Feeling good about myself)
- Empathy (Understanding how others feel)
- Perspective-taking (Someone else's shoes)
- Intergroup trust (Better together)
- Coping and problem-solving (Mind craft)
- Outgroup Attitudes (Interacting and building relationships with other groups)

These indicators formed the basis for a monitoring and evaluation framework to be used in the digital resilience app, around which gamification was planned to promote and support engagement by C&YP in the content and questions put forward in the app via simple games.

### Methods

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Based on this monitoring and evaluation framework, co-production workshops were designed and held with groups of young people aged 8-23, to identify, explore and seek consensus on ideas for the gamification of the app, assisted by C&YP support workers. Pilot workshops validated the proposed question areas and focus for the six main workshops to engender design thinking for the app.

#### Results

In the app, there are 3 challenges to complete for the six indicators, 18 games and activities in total. Players complete an indicator-specific questionnaire, based on the games and activities they have engaged in, both before and after each level. As players progress through the game, stars are earned as a reward and players are then ranked according to how many stars they have earned. There are four ranks that can be achieved, from Student, through Expert, then Ambassador to Champion

#### Conclusion

Evidence illustrates that resilience training and interventions can support a decrease in psychological distress and increase suicide resilience. This app will provide a population wide resource that can be used to improve resilience and peace building, and evaluate changes in attitudes, knowledge, behaviours, and skills across these indicators through the gamification of interventions relating to these.

#### Acknowledgements

OUR Generation project is supported by the European Union PEACE-IV Programme.

## Session: Child, youth and student mental health

# Improving students' access to mental health support services using Pathway

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**Keywords:** mental health, AI, help-seeking, mental health app, college students

Past research has shown a high prevalence of mental health difficulties among college students. Despite this, it is well known that young people tend to avoid seeking support from professional mental health support services. Compared to other countries, surveys in the Republic of Ireland have revealed that a significant percentage of young people seek professional mental health support. However, there is limited information on how students in Ireland perceive the mental health support they receive from these services.

Therefore, we surveyed University College Cork (UCC) students in the Republic of Ireland. Participants were asked to discuss their experiences with the mental health support they received during the COVID-19 pandemic. They were asked to discuss their experiences in reaching out for support, how helpful/unhelpful the support was, and if they would continue using that form of support.

Participants were also asked to discuss their experiences with the UCC counselling service, on-campus services and external services. They were asked to elaborate on the process of finding out about the service, the process of getting an appointment with a service, and the benefits/shortcomings of a service. A total of 452 students participated in the survey, only the aforementioned experiences are addressed in this study.

The data was analyzed using thematic analysis. The analysis revealed three main stages in students' help-seeking journey including an awareness of difficulty and sourcing for help; interaction with services; and use of services. We also identified pain points that students encounter in each of these help-seeking stages.

In the first stage, participants found the search for the right support to be an arduous process. Participants felt that others probably needed the support more than they did, they found it difficult to reach out for support, they had negative expectations of services, etc.

In the second stage of the help-seeking process when participants were interacting with services, they found that services were costly, waiting times were long, they received no response from services, etc.

In the third stage of the help-seeking process, when participants were using a service, they found that they did not have the same counsellor from one session to the next, the cost of the service was too high to continue using the service, the counsellor/therapist was not the right fit for them, etc.

Consequently, we introduce Pathway, a web-driven AI-based application that connects students to the mental health support services they need.

Pathway performs three main functions: it validates students' need for mental health support through a mental health survey; it provides a recommendation of mental health support services based on the student's chosen preferences (e.g. cost of service, the format of service (online/face to face), therapy approach, etc); and it provides curated information about a service including the price, services offered, reviews, FAQs, opening hours, etc.



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We believe that by addressing the aforementioned pain points during the help-seeking process, Pathway will improve students' access to mental health support services.

## **Session: Social media and media reporting**

# **Impact of Problematic Social Media Use Interventions on Mental Well-Being: A Systematic Review**

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**Keywords:** review, social media, mental well-being, mental health, intervention

**Background:** Problematic social media use occurs when social media interferes with a person's daily life and mental well-being. Problematic social media use interventions, e.g., abstinence from social media, have the potential to improve users' mental well-being. However, there is limited understanding of the effectiveness of this and other types of interventions.

**Objective:** This systematic review aimed to synthesise literature on the effectiveness of problematic social media use interventions in improving mental well-being in adults.

**Methods:** A systematic search (2004 – June 2022) was completed across three databases in accordance with PRISMA guidelines. Experimental studies evaluating the impact of problematic social media use interventions on mental well-being in adults were included. Outcomes related to mental well-being, such as depression, anxiety, stress and loneliness, were included. A narrative synthesis without meta-analysis was completed to summarise study characteristics and effectiveness by outcomes and intervention type. The Quality Assessment Tool was used to measure quality.

**Results:** Of 2,785 results, 17 studies were included in the analysis. Most studies (9/17, 53%) found improvements in mental well-being, five (5/17, 29%) found mixed effects and three found no effect on mental well-being. Therapy-based interventions, that used techniques like Cognitive Behavioural Therapy, were more effective than limiting use or full abstinence from social media, with 83% (5/6) of these studies showing significant improvements in mental well-being, compared to 50% (2/4) and 43% (3/7) respectively. Depression was the most frequently investigated and improved outcome with 67% (6/9) showing a significant improvement in depression after the intervention, while other outcomes showed more varied results. Quality was poor with 94% (16/17) of studies receiving a weak global score, mostly for issues with selection bias.

**Conclusions:** This review provides some evidence that problematic social media use interventions are effective in improving mental well-being, especially for depression and when using therapy-based interventions. Further experimental and longitudinal research is needed with representative samples to investigate who may benefit most from problematic social media use interventions. This will help to develop guidance and recommendations for parents and carer, educators, policymakers and clinicians on how best to manage problematic social media use

## **Session: Social media and media reporting**

# **Towards the coding of suicide-related media articles to support analysis of adherence to media guidelines**

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**Keywords:** Media reporting, Suicide, Guidelines.

### Background

How suicide is reported in the media has been linked to imitational suicidal behaviour among vulnerable people, particularly when the report is in relation to the suicide of a celebrity. This has led to the development of guidelines for the responsible reporting of suicide. However, there is an opportunity to develop a comprehensive coding scheme for assessing media adherence to these guidelines.

### Aims and objectives

This research seeks to develop a coding protocol for assessing responsible reporting of suicide.

### Methods

The coding protocol will be developed in two stages; (i) a review of the existing literature on responsible reporting of suicide to develop the protocol, and (ii) application of the coding protocol to be applied to a relevant dataset. A dataset has been provided by Headline, which is Ireland's national media programme for responsible reporting, and representation of mental ill health and suicide. The overall dataset contains over 5,000 articles from 2019-2021 related to either suicide or mental ill health. This project focuses on a subsample of articles within this dataset, which focus on suicidal behaviours.

### Results

Results are reported in terms of (i) how responsible reporting of suicide has been measured in the past research, (ii) how the existing categories actually apply to the Headline dataset, and (iii) suggestions as to how improve the coding process to assess the responsible reporting of suicide.

### Conclusions

The coding protocol is discussed in terms of; (i) the challenges associated with classifying articles related to suicide within the media, and (ii) the need for standardised coding protocols within this domain. This coding scheme would allow us to track and analyse how media articles adhere to guidelines.

## **Session: Dementia**

# **The InspireD reminiscence app.....a more personalised reminiscence experience for people living with dementia and their carers**

Assumpta Ryan (1), Claire McCauley (1), Debbie Goode (1), Deirdre Harkin (1), Aoife Conway (1), Maurice Mulvenna (2), Raymond Bond (2) Kyle Boyd (3), Brendan Bunting (4), Finola Ferry (4), Kevin Curran (5), Ashleigh Davis (6).

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**Keywords:** reminiscence, dementia, app, carer, wellbeing, quality of life

### Introduction

Reminiscence is widely used as a psychosocial intervention in dementia care. This study investigated the outcomes of a home based, individual specific reminiscence intervention facilitated by an iPad app (InspireD) for people living with dementia and their family carers.

### Method

The study used a quasi-experimental design with three phases. Phase 1: A User Development Group comprising a paired sample of 6 people living with dementia and their family carers worked with the research team to design and test the technology. Phase 2: The InspireD reminiscence app was then used at home for 12 weeks by 30 people living with dementia and their family carers. Outcome measures examined the impact of reminiscence on mutuality, wellbeing, quality of life and quality of the relationship between participants living with dementia and their family carers. Phase 3: Individual interviews were conducted with a sample of participants (n=31) to explore their experience of the intervention.

### Results

People living with dementia used the app independently and more frequently than their carers. There were statistically significant increases in mutuality ( $p < .0005$ ), quality of caregiving relationships ( $p < .0005$ ), and emotional well-being ( $p < .0005$ ) from baseline to endpoint for people living with dementia. For carers, there were no significant changes in these outcome measures from baseline to endpoint. Participating dyads perceived the intervention as a positive experience which focused on gains rather than losses in the context of memory retention and learning new skills.

### Conclusion

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Individual specific reminiscence supported by an iPad app can deliver positive outcomes for people living with dementia and their carers. See <https://www.theinspiredapp.com/> for more information and publications.

## Session: Dementia

# A personalised lighting and health intervention technology to deliver improved wellbeing for people living with dementia in care homes

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**Keywords:** Wellbeing, dementia, quality of life, IoT, circadian lighting, sensors, circadian rhythm

Living with dementia can have an impact on mental health and wellbeing. There are associated behavioural and psychological symptoms which present throughout the day and can negatively affect quality of life. Commonly discernible within these symptoms are poor sleep quality, agitation, low mood and fluctuating rest-activity patterns; all of which can be managed by supporting the body's circadian rhythm.

The circadian rhythm is controlled through lighting cues, whereby light is the stimulus which instructs the main body clock and its peripheral clocks to initiate functions such as hormone balance, body temperature and metabolism. In turn, coordinating these functions can influence the severity of dementia symptoms and can be used as an aid to wellbeing. Daylight is accepted as the best resource for harmonising our circadian rhythms with our evolutionary needs. Since humans spend around 90% of their time indoors, this daylight needs to be made available indoors. One way to achieve this is through the use of circadian lighting; light which is diurnally dynamic and resembles the sun.

Monitoring the impact of aligning a person's circadian rhythm can be achieved by implementing digital technologies. However within dementia cohorts, additional symptoms such as cognitive decline may make this difficult to implement using wearable technologies. In this work, environmental radar sensors are integrated within luminaire fittings in order to monitor the symptoms which can be directly influenced by a changing circadian rhythm. Of particular focus is the rest-activity patterns and sleep-wake cycles. This work is currently being implemented as part of a trial in a care home in Belfast.

The luminaires and sensors are connected in an Internet of Things centred around an intelligent backend behavioural logic. This logic reads sensor data and applies algorithms which deliver activity and sleep-wake metrics with the use of dementia activity domain knowledge. An assessment of the changes in activity can then be used to better inform the circadian lighting on an individual basis. If required, this occurs via modifications to the timings, durations, colour temperature and intensities, in order to phase-shift sleep and encourage fewer bouts of high activity in the evening before bed (sundowning). This data is presented on a group and individual basis in order to further explore the relationship between dementia, lighting and circadian rhythms. These conclusions can then inform the best default lighting for supporting the wellbeing of future residents with dementia.

In summary, a more aligned circadian rhythm for people living with dementia can improve the severity of some of the most common symptoms. Therefore, both the information and actuation provided by this digital health

intervention can support the wellbeing of people who are living with dementia. In turn, this can improve their quality of life and also offer some relief on the pressures faced by traditional healthcare services today.

**Session: Dementia**

## **Ethical Issues Related to Assistive Technology and Diminishing Privacy**

Paul McCullagh [1], Ian Cleland [1], Cristiano Paggetti [2], Cristian Leorin [3], Eloisa Stella [3] and Chris Nugent [1]

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**Keywords:** Ethics, assistive, technology, education,

**Introduction.** The era of ubiquitous sensors, Internet of Things (IoT), Artificial Intelligence and data science has already delivered innovation in commercial sectors (e.g., driverless cars, social media). These technologies can be further embraced to help with personalization of Assistive Technology to promote wellbeing. Dementia is a multi-faceted condition and each person with dementia and their carer has individual needs. Hence, it is no surprise that generic assistive technology has had limited success. We are in an era of personalized push notifications, which could support the management of dementia, particularly regarding reminders for scheduling and task completion. However, the benefit of this technology revolves around the gathering and use of personal information (condition, functional deficit, medication, and adherence) and sensing data (e.g., location, activity undertaken, services used) in order to obtain context, which can be intrusive if not properly controlled.

**Methods.** The deployment of assistive technology needs to be driven by ethical use of sensing technology and control of sensitive data that may be recorded and stored on cloud-based servers. Issues such as location tracking, autonomy, and the right to be forgotten are highly relevant to us all but especially to people with dementia and their carers. For example, as the condition of the person with dementia changes (potentially deteriorates), consent for monitoring may need to be re-affirmed. In this presentation we discuss issues that have emerged from working with people in the REMIND project. REMIND used computational techniques to improve compliance to reminders within smart environments. The REMIND participants (persons with dementia, carers, and sector specialists) were engaged as co-researchers and provided requirements for demonstrators as well as instruction, guidance and education for the next generation of innovators at three summer schools attended by early-stage researchers in disciplines related to assistive technology.

**Results and Conclusions.** Demonstrators were developed to a conceptual stage by multidisciplinary teams of 3-4 participants. Critique and feedback were provided. These fed into implementations. While statutory ethical approval addresses aspects of consent and dignity for participants in studies and the subsequent protection of personal data, it is only by working with people with dementia and their carers that issues such as personal autonomy and beneficence become more apparent. By facilitating communication between stakeholders with early-stage researchers we expect ethics to be built into Assistive Technology at the requirements and design stage.

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## **Additional talks**

Recent developments in Conversational AI: Challenges and Opportunities, Mike McTear, Ulster University

Potential applications for MENHIR and other digital innovations in services, David Babington, Action Mental Health

Detecting Depression in Speech using Verbal Behavior Analysis, Anna Esposito, Università degli Studi della Campania

Developing and Implementing Virtual Reality Innovations for Psychological Therapies, Adam Elliott, Psychological therapies service, HSC NI, Northern Trust

A new generation of mental health professionals in the digital age, Colin Gorman, Pneuma Healthcare

Publishing and advice for early career researchers, Tillie Cryer, Senior Managing Editor, Nature Portfolio

What does a good paper look like? Alison Cuff, Team Manager, BMC series (BMC digital health)

Digital Health Innovation Clusters, Joanne Boyle, Digital Health & Care Innovation Centre

MindApps.org: An Informed, Systematic Way to Choose Mental Health Apps, Asher Cohen, Harvard Medical School

## Programme

### Pre-conference public event - Wednesday 21st June 2023

#### Day 1 - Thursday 22nd June 2023

8.30 - 9.00 am      Registration

**8.30 am      Coffee and reception**

9.30              Welcome from Prof. Raymond Bond and Prof. Luke Chen, Professor of Data Analytics & Research Director for the School of Computing

Chair: Raymond Bond

9.45              **Keynote 1: The path towards the personal: a HCI perspective on Digital Mental Health, [Gavin Doherty](#), Trinity College Dublin**


10.30             Q&A

Chair: Patrick McAllister

#### **Session: Digital interventions**

10.40             UKRI funding call: Mindset – Immersive Therapeutics for Mental Healthcare, Julia Glenn, Design Innovation Lead, UKRI

10.50             Stakeholder perspectives and experiences of the implementation of remote mental health consultations during the COVID-19 pandemic: a qualitative study, Emer Galvin\*, School of Pharmacy and Biomolecular Sciences, Royal College of Surgeons in Ireland, Dublin, Ireland

11.00             Utilisations of an online mental health recovery narrative intervention (NEON), Yasmin Ali\*, School of Health Sciences, Institute of Mental Health, University of Nottingham, Nottingham, UK - **Best paper award**  


11.10             Personalisation and Recommendation for Mental Health Apps: A Scoping Review, Clemence Rhodes-Maquaire\*, University of the West of England, College of Arts, Technology and Environment, Bristol, UK

11.20             Digital tools for mental wellbeing intervention, Fiona Hegarty\*, Maynooth University

11.30 Q&A

**12.00 Lunch**

**MENHIR workshop/sessions - Conversational systems for mental health & NLP**  
**(Talks related to chatbots and natural language processing)**

Chair: Edel Ennis

1.00 **Keynote 2: Speech and language technologies in digital mental healthcare, [Zoraida Callejas](#), University of Granada**

1.45 Q&A

Chair: Mike McTear

1.55 Assessing user retention in a longitudinal digital mental health data collection study to develop vocal biomarkers, Philip Donaghy, Ulster University, School of Computing

2.05 Usability analysis of a mental health and wellbeing chatbot, and the association between usability and perceived effectiveness, Edel Ennis, Ulster University, Northern Ireland, UK

2.15 Awareness and views of healthcare professionals towards mental health chatbots, Courtney Potts\*, School of Psychology, Ulster University

2.25 Exploring the Influence of the Design of Counseling Chatbots on Counseling Outcomes, Mohammad Amin Kuhail\*, College of Interdisciplinary Studies, Zayed University

2.35 Maternal Mental Health Monitoring in an Online Community: A Natural Language Processing Approach, Zhen Zhu\*, University of Kent, Kent Business School, UK

2.45 Harmony: A global platform for contextual harmonization, translation and cooperation in mental health research, Eoin McElroy\*, Ulster University, School of Psychology, Northern Ireland, UK

2.55 Q&A

**3.10 Coffee break**

Chair: Orla McDevitt-Petrovic

**Updates & talks from MENHIR investigators: conversational systems for mental health**

- 3.40 Findings from a textual analysis of the MENHIR conversational corpus, Zoraida Callejas, University of Granada
- 3.50 Recent developments in Conversational AI: Challenges and Opportunities, Mike McTear, Ulster University
- 4.00 Detecting Depression in Speech using Verbal Behavior Analysis, Anna Esposito\*, Università degli Studi della Campania
- 4.10 Q & A

**End of MENHIR workshop/sessions - Conversational systems for mental health & NLP**

Chair: Joseph Rafferty

**Session: Virtual reality & gaming**

- 4.25 Virtual reality (VR) game for the relaxation and expressive experiences of older adults, Lee Cheng, Anglia Ruskin University
- 4.35 Adapting Exposure Therapy for Public Speaking Anxiety, the use of 360° Video Virtual Reality, Rachel Reeves\*, Queens University Belfast, School of Psychology - **Best paper award** 🏆
- 4.45 The Metachurch: How Might the Metaverse Impact Religious Practice, Justin Thomas\*, King Abdulaziz Center for World Culture (Ithra), Digital Wellbeing Program (Sync), Dhahran, Saudi Arabia
- 4.55 Exploration of Gaming Disorder Across 30 Nations, Justin Thomas\*, King Abdulaziz Center for World Culture (Ithra), Digital Wellbeing Program (Sync), Dhahran, Saudi Arabia
- 5.05 Q&A
  
- 18.30 Buffet dinner for registered & invited guests (Ulster University, room **BD-00-011 - served by Academy Restaurant**) Welcome by Professor Melanie Giles, Professor & Head of the School of Psychology

## Day 2 - Friday 23rd June 2023

### 8.30 am Coffee and reception

Chair: Lu Bai

#### Session: Data science and AI

9.00 am Patient-Generated Real World Data Collected from Digital Health Technologies: The “30,000-Foot View” of the Evidence Across Years, Conditions, and Geography, Evelyn Pyper\*, Department for Continuing Education, University of Oxford, Oxford, UK

9.10 The app features that are linked to the quality scores and user ratings of mental health apps: a machine learning approach, Maciej Hyzy\*, School of Computing, Ulster University

9.20 A multivariate exploratory data analysis of a crisis text messaging service to measure the impact of the COVID-19 pandemic on mental health in Ireland, Hamda Ajmal\*, Data Science Institute, University of Galway, Ireland

9.30 From Data to Semantic: A New Method for Building Ontologies in Mental Illness Realm, Rosalba Mosca\*, DIIN University of Salerno, Fisciano (SA), Italy

9.40 MindApps.org: An Informed, Systematic Way to Choose Mental Health Apps, Asher Cohen (invited), Harvard Medical School - **Best paper award** 🏆

9.50 Q&A

Chair: Raymond Bond

10.10 **Keynote 3: Examining real life reward function using digital ecological momentary assessment to find targets for anhedonia in adolescents, [Ciara McCabe](#), Reading University**

10.55 Q&A

Chair: Kyle Boyd

#### Session: Talks from industry & service providers - part 1

11.15 Potential applications for MENHIR and other digital innovations in services, David Babington\*, Action Mental Health

11.25 Real-world usage of a digital mental health intervention in the workplace – sector analysis, Gillian Cameron\*, Inspire Wellbeing

11.35 Developing and Implementing Virtual Reality Innovations for Psychological Therapies, Adam Elliott, Psychological therapies service, HSC NI, Northern Trust

11.45 Q&A

**12.00 Lunch**

**12.30 Lunch time short mentoring session on publishing:**

Chair: Courtney Potts

12.30 [Publishing and advice for early career researchers](#),  
Tillie Cryer, Senior Managing Editor, Nature Portfolio

12.45 [What does a good paper look like?](#) Alison Cuff, Team Manager, BMC series (BMC digital health)

Chair: Anne Moorhead

**Session: Talks from industry & service providers - part 2**

13.00 Digital Health Innovation Clusters, Joanne Boyle\*, Digital Health & Care Innovation Centre

13.10 Building AI responsibly for mental healthcare, Umar Nizamani\*, NiceDay International

13.20 Digital Mental Health Approaches in remote communities – Outer Hebrides, Scotland, Martin Malcolm, NHS Western Isles, Health Board, Department of Public Health Intelligence, Scotland

13.30 The potential of Klenico as a digital diagnostic tool for improving diagnostic quality in psychotherapy, Mareike Augsburger\*, Klenico Health AG, Zurich, CH

13.40 A new generation of mental health professionals in the digital age, Colin Gorman, Pneuma Healthcare

13.50 Q&A

Chair: Maurice Mulvenna

2.00            **Keynote 4: Smartphone Digital Psychiatry: Understanding New Data, Clinical Opportunities, and Marketplace Apps, [John Torous](#), Harvard Medical School**

2.45            Q&A

**3.00            Coffee break**

Chair: Colin Gorman

**Session: Child, youth and student mental health**

3.30            Reporting and specifying the initial implementation strategies used in centralised digital youth mental health care, Mary Clare Douglas, Jeff Moore\*, Jigsaw

3.40            Verbal Wellbeing: A Digital Mental Health App for Improving Wellbeing in Children, Natalie Divin\*, Verbal Arts Centre, Stable Lane & Mall Wall, Bishop Street Within, Northern Ireland - **Best paper award** 🏆

3.50            Our Generation app: co-designing a digital intervention engendering resilience and self-awareness in children and young people, Colette Ramsey, Ulster University

4.00            Improving students' access to mental health support services using Pathway, Olugbenga Oti\*, School of Computer Science & IT, University College Cork, Ireland

4.10            Q&A

Chair: Leona Doran

**Session: Social media and media reporting**

4.20            Impact of Problematic Social Media Use Interventions on Mental Well-Being: A Systematic Review, Ruth Plackett\*, UCL Research Department of Primary Care & Population Health

4.30            Towards the coding of suicide-related media articles to support analysis of adherence to media guidelines, Colm Sweeney\*, Ulster University

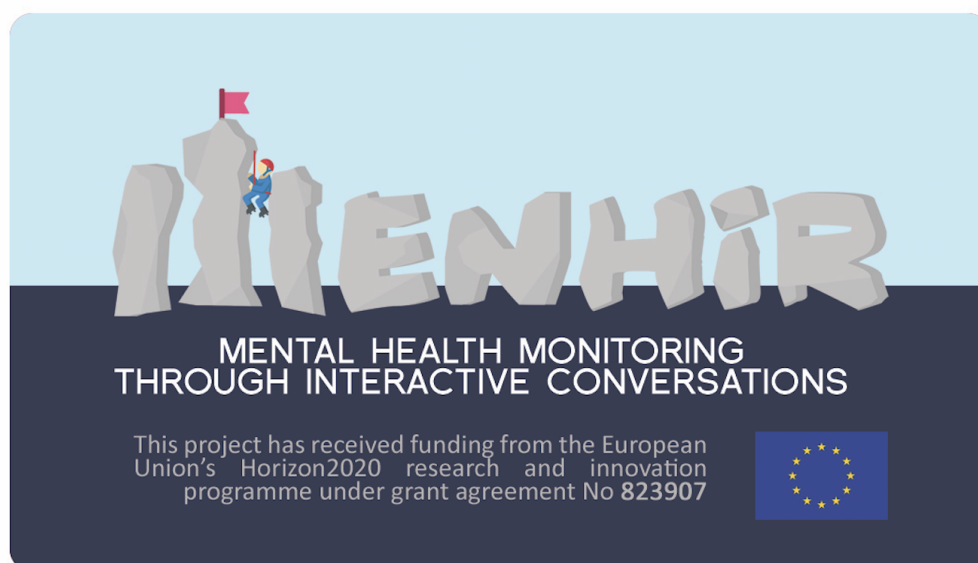
4.40            Q&A

Chair: Magda Bucholc

**Session: Dementia**

- 4.50 The InspireD reminiscence app.....a more personalised reminiscence experience for people living with dementia and their carers, Assumpta Ryan\*, Ulster University
- 5.00 A personalised lighting and health intervention technology to deliver improved wellbeing for people living with dementia in care homes, Kate Turley\*, Chroma Lighting
- 5.10 Ethical Issues Related to Assistive Technology and Diminishing Privacy, Paul McCullagh\*, Ulster University, School of Computing, Northern Ireland
- 5.20 Q&A
- 5.40 Best presentation awards, [feedback survey](#) & close of conference

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