

EDITH COWAN UNIVERSITY

SIMULATION & IMMERSIVE
DIGITAL TECHNOLOGY GROUP



SCOPE AND OPPORTUNITIES

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IMMERSIVE DIGITAL TECH

BACKGROUND

Modern virtual reality (VR) technology enables highly immersive simulated experiences which engage users with authentic virtual worlds. Specialist software is used to integrate digital surround sound and visual effects to produce VR environments through which users can explore, discover and learn. Since first appearing in the 1960's, VR technologies have evolved to enable near real world human experiences. The advent of tools such as the 'Oculus Rift' and 'HTC Vive' have provided a step change in making VR technology highly user-friendly and economically accessible. VR is hugely popular and well-established in the entertainment industries.

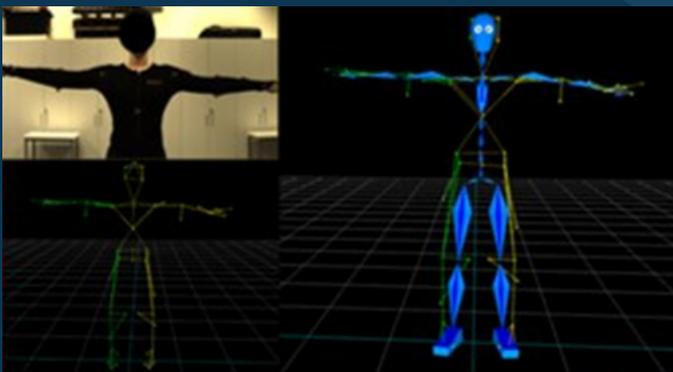
VR separates itself from augmented reality (AR); where VR is a computer-generated re-creation of a real-world environment, AR layers computer-generated enhancements atop an existing reality. AR is commonly associated with mobile devices that blend digital components into the real world such that they enhance one another.

Both VR and AR are considered novel in the education and training setting, with technology only very recently becoming available that makes education and training in this sector viable. In the education and training setting, AR has been shown to be effective in the training of some haptic skills, whereas VR has been shown to be more effectively utilised for the training of 'soft' skills such as communication, coordination, teamwork and empathy.



The education and training sector is now quickly adopting VR technology through the utilisation of engaging, collaborative and cost-effective learning experiences. The value of utilising VR technology for education and training is that experiences can be delivered at a time that works for individuals and teams without the need for large amounts of coordinated resources and staffing. Feedback can be built into bespoke applications allowing users to receive feedback on their decision-making. This allows users to work to improve through repeated use, with data being securely stored within each user's profile and updated after each experience, allowing improvement to be monitored over time. Also, standardisation of training through VR applications ensures all users can experience standardised training, as opposed to many forms of in situ simulation-based training which can vary between scenarios, across trainers and across sites. Further, with simple adjustments to software, different policy and protocol considerations can be made to ensure training aligns with guidelines and/or protocols from different jurisdictional systems.

When applied in education and training, VR can improve workers' skill and responses for both routine and emergency tasks by recreating task environments, settings, situations and circumstances otherwise difficult to replicate in real-world conditions. Through exposing personnel to rare and highly chaotic situations, from a fully immersive first or third-person perspective, in entirely safe environments, VR experiences can expose and prepare individuals and teams for incidents impossible or too expensive to recreate in a classroom or mock training facility.



SIMULATION & IMMERSIVE DIGITAL TECHNOLOGY GROUP

The Simulation & Immersive Digital Technology Group (SIDTG), operating out of Edith Cowan University in Western Australia, is comprised of a multidisciplinary research and development team who investigate the use of digital and immersive technologies, such as serious games and virtual reality, for real world simulation and educational needs. This unique collaborative team bring together skills which cover health and exercise sciences research, simulation education, serious game theory, game design, animation, biomechanics, AI and machine learning.

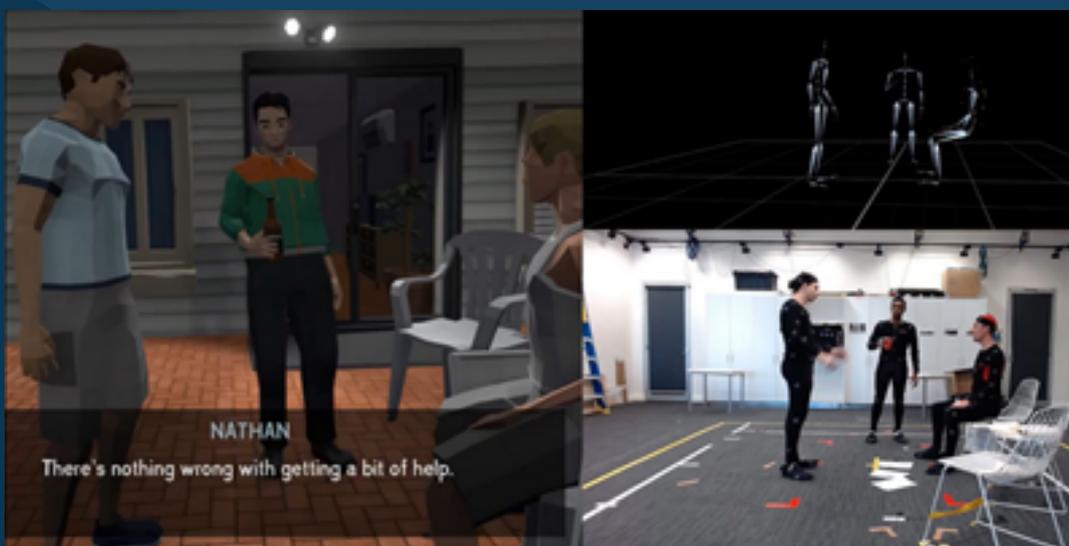
Through use of an ECU in-house industry standard 21 camera motion capture studio, high fidelity, human focussed virtual simulations can be produced and evaluated which are difficult to replicate in real-world conditions. This gold standard infrastructure facilitates both high fidelity digital human animation as well as high accuracy biomechanical human movement analyses. Based at the ECU Mt Lawley campus, the ECU Motion Capture Studio is directly connected with the talented Western Australian Academy of Performing Arts (WAAPA) acting department.

Leading immersive simulation brings the unique needs of each client into customised virtual training environments.

The expertise and infrastructure housed in the ECU Motion Capture Studio enables fast production of digital simulation and training that are adapted to individual client needs. Generic off the shelf simulations can be replaced by authentic virtual simulations made explicitly to recreate client working environments. Customised simulations train the specific staff skills required for their bespoke workplace health and safety needs.

Formative and evaluative research contribute to the evidence base informing best practices for applied immersive simulation and education. Real world engagement and impact is recognised through consultation with industry partners and end-users, and the implementation of immersive simulation experiences which are developed for bespoke industry needs.

The SIDTG collaborates with a series of co-design partners across Government, Non-Government (NGO) and private organisations. Our research and development pathway has been refined to ensure developed applications meet end-user requirements, incorporating a research agenda alongside game/software development to a scientific, publishable level.



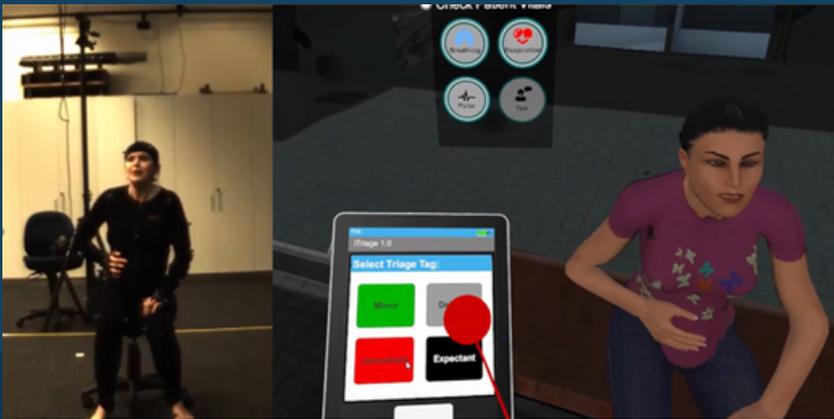
SIDTG CAPABILITY OVERVIEW

PROJECT TYPES

- Screen-based education applications
 - Video-based
 - Computer generated
 - Serious Games
- Immersive virtual reality applications
- Augmented reality applications
- Mixed/extended reality applications



RESEARCH & DEVELOPMENT PIPELINE



Formative research

- Project scope
- Nature of the problem
- End-user requirements
- Platforms

Design & Storyboarding

- Project specifications
- Learning objectives
- Narrative
- Mechanics

Application build

- In-house software development capability
- Unity game engine
- Motion capture studio
- WAAPA actors

Evaluation

- Contribution towards learning
- Mixed-methods
- HDR students



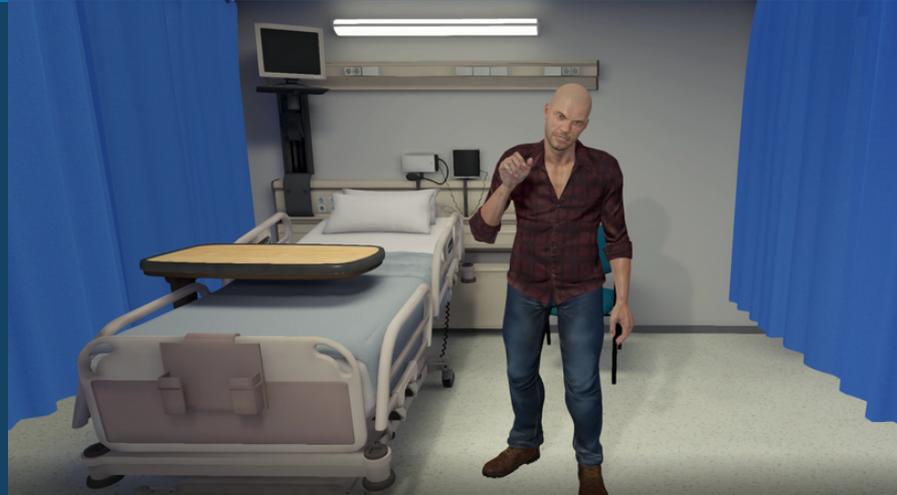
A brief synopsis of key SIDTG projects (non-exhaustive) are outlined hereafter. Links to project video resources are provided on the last page.

IVADE: IMMERSIVE VIOLENCE & AGGRESSION DE-ESCALATION EXPERIENCE FOR FRONTLINE HEALTHCARE PROFESSIONALS

IMMERSIVE VIRTUAL REALITY

Partners:

- North, South and East Metropolitan WA Health Services
- Rockingham General Hospital
- Fiona Stanley Hospital
- Sir Charles Gairdner Hospital
- Royal Perth Hospital



PROJECT SYNOPSIS

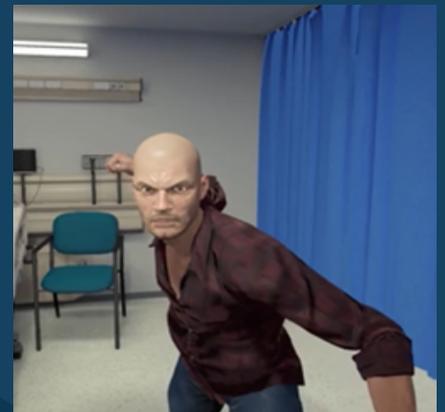
Violence and aggression towards front line healthcare workers represents a rapidly increasing strain on Australian hospitals. Provision of face-to-face education and training for hospital staff in early identification of aggressive patients, appropriate response plans, and avoidance or de-escalation is problematic due to limited resources, staff time, and lack of consistency. This immersive virtual reality (VR) application provides a novel method of training for early aggression identification and de-escalation techniques for Emergency Department (ED) front line healthcare.

The value of utilising VR technology in this space is that training can be delivered at a time that works for individual clinicians without the need for large amounts of coordinated resources and staffing. Feedback is built into the application allowing users to gauge their decision-making and work to improve through repeated use, with this data being securely stored within each users profile and updated after each experience allowing improvement to be monitored over time. Also, standardisation of training through VR applications ensures all users can experience the same training, as opposed to many forms of in situ simulation-based training which can vary scenario to scenario. Further, with simple adjustments to the software, different policy and protocol considerations can be made to ensure training aligns with guidelines from different hospital systems.

Ensuring staff feel safe and confident at work is imperative to successfully manage potentially violent situations, alleviate associated workload stressors, and limit resource drain on healthcare (and other) systems.

PRESENTATIONS

- Australasian Simulation Congress, Adelaide (21–24 August 2023)
- EMHS Public Sector Community of Practice Event, Perth (11 May 2023)
- Science on the Swan 2023, Perth Australia (8–10 May 2023)
- The Teaching and Learning Forum, Perth (2–3 February 2023)
- Western Australian Simulation in Healthcare Alliance Annual General Meeting 2022, Perth (10 November 2022)
- Perth Children’s Hospital Simulation Interest Group, Perth (online) (25 August 2022)
- Australian & New Zealand Association for Health Professional Educators Festival, International (online) Australia (13 July 2022)
- University of Western Australia – Education Research Symposium, Perth (10 May 2021)



PUBLICATIONS

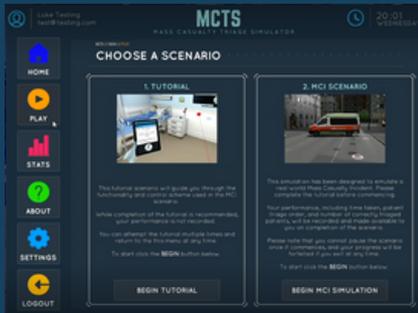
- Johnson J., Hansen S., Hopper, L. Brook, L., Watson, J. & Mills, B. (2022) (Under review) A qualitative study exploring perspectives of frontline healthcare professionals. International Emergency Nursing.

ENHANCING PREPAREDNESS TO MASS CASUALTY INCIDENT RESPONSE FOR EMERGENCY RESPONDERS

IMMERSIVE VIRTUAL REALITY

Partners:

- St John Ambulance WA
- Queensland Ambulance Service



PROJECT SYNOPSIS

Mass/multi casualty (MC) events are catastrophic. The involvement of multiple casualties can readily overwhelm the resources available to a single health professional and health professional teams. Such events occur from man-made or natural disasters and cause devastating injuries to large numbers of people and disastrous losses to entire communities. It is imperative paramedics are effectively trained to respond. Current MC training practices have been described as 'clunky', costly, highly-resource intensive and providing limited learning value, so much so that training is rarely provided for emergency response personnel, leading to documented response issues from actual disasters. Mass casualty response training delivered through virtual reality technology provides an easily accessible, standardised, authentic format for mass casualty response education, and has been demonstrated to be similar with respect to learning contribution to large-scale mass casualty simulations (previously considered the gold standard training format requiring an enormous amount of resources to deliver).

ACCOLADES

- Winner; ACS Digital Disruptor Awards Finalists, 2019 (Skills Transformation of Work Teams (Large))
- Winner; 28th West Australian Information Technology and Telecommunication Alliance INCITE Awards, (Most Transformative Impact on Education)
- Winner; Vice Chancellor's Inspiring Staff Award, Teams.
- Finalist; Serious Games Showcase and Challenge Australasia
- Finalist; Australian Information Industry Association National iAwards (Community & Consumer Markets)
- Finalist; 28th West Australian Information Technology and Telecommunication Alliance INCITE Awards (Most Innovative Enabler in Health Care)

PUBLICATIONS

- Mills, B., Dykstra, P., Hansen, S., Miles, A., Rankin, T., Hopper, L., Brook, L. & Bartlett, D. (2020) Virtual reality triage training can provide comparable simulation efficacy for paramedicine students compared to live simulation-based scenarios. *Prehospital Emergency Care*. 24:4, 525–536.

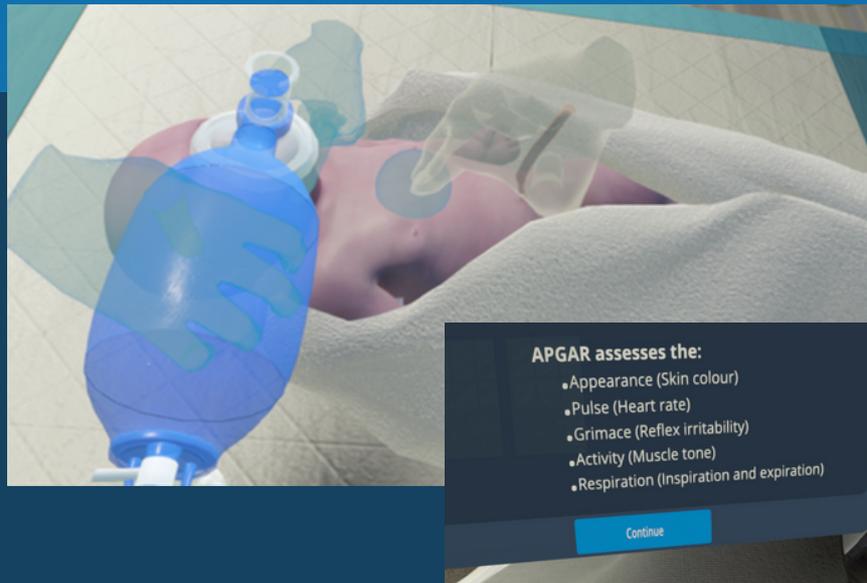


EARLY NEONATE MANAGEMENT AND ONE-MINUTE APGAR

IMMERSIVE VIRTUAL REALITY

Partners:

- St John Ambulance WA
- University of Tasmania
- Notre Dame University
- St John of God Midland Public Hospital
- St John of God Subiaco Hospital
- WACHS
- Wise Realities Institute for Healthcare Emerging Technologies Research



PROJECT SYNOPSIS

Ongoing professional education is essential to maintain clinical competency, confidence and ensure currency of knowledge. Situations rarely encountered in the clinical setting are often overlooked for continuing professional development, which is problematic for high-risk cases attended by underprepared paramedics. Prehospital management of out-of-hospital births, complications, and early neonate care fall into this category.

This virtual reality program has been designed to bridge the theory-practice gap encountered by prehospital clinicians and help retain vital obstetrics skills. Specifically, this immersive simulation program includes two scenarios delivering education on essential clinical care provided by prehospital clinicians immediately following a birth. The first scenario walks learners through an uncomplicated neonatal early assessment, incorporating the one-minute APGAR, in a systematic manner. The second scenario branches into two possible outcomes; (1) respiratory resuscitation with a bag-valve-mask or (2) cardiopulmonary resuscitation. Information is delivered to learners through the immersive head-mounted display and audio prompts. Handheld controllers allow learners to interact with the virtual learning environment.

The immersive virtual reality program can act as a standalone tool delivered as regular refresher training or can easily be embedded into a more comprehensive in-service training program. The heightened accessibility of an immersive virtual reality training solution in this space will contribute toward enhancing clinician preparedness when managing out-of-hospital births.

PRESENTATIONS

- Perth Children's Hospital (PCH) Simulation Interest Group Presentation, Perth (6 April 2023)
- Services for Australian Rural & Remote Allied Health (SARRAH) National Conference, Australia (15 November 2022)
- Edith Cowan University ECulture Symposium presentation, Perth (31 October 2022)

PUBLICATIONS

- Hill MG, Flanagan B, Mills B, Hansen S, Hopper L. Paramedic training, experience, and confidence with out-of-hospital childbirth (OOHB) in Australia. *Australasian Emergency Care*. 2022 Sep 10.
- Hill M, Miles A, Flanagan B, Mills B, Hopper L. Out-of-hospital births and the experiences of emergency ambulance clinicians and birthing parents: a scoping review protocol. *BMJ open*. 2022 May 1;12(5):e062313.



PARAVERSE: TACTICAL PARACHUTE TRAINING FOR DEFENCE PERSONNEL

IMMERSIVE VIRTUAL REALITY

Partners:

- Department of Defence
- Curtin University
- Murdoch University



PROJECT SYNOPSIS

Safe and effective advanced tactical parachute navigation and manoeuvring under high-risk conditions necessitates repetition-of-practice. While knowledge acquisition can occur via traditional training techniques involving training manuals, lectures and procedures practice, experiential learning is limited to actual jumps. Compressed timeframes to complete manoeuvres, as well as imposed jump limits and meteorological conditions severely reduce opportunities to practice. Each of these individual descents may be interrupted by several hours of fitting and checking equipment, climbing to altitude, circling for each individual or team to jump and returning to the administration area or drop zone. This project has capacity to revolutionise military parachutist training across Defence, through the novel research and development of an immersive virtual reality (IVR) enhanced tactical parachute application designed for training of tactics, techniques and procedures otherwise impossible to replicate in real-world environments.

The system recreates a first-person view, visualised and displayed to the user through a virtual reality headset, and allows the user to control a virtual parachute from parachute opening to the point just before the user virtually lands. After the VR experience, the system allows users to review their parachute descent.

PRESENTATIONS

- Australasian Simulation Congress, Adelaide (21-24 August 2023)
- Indian Ocean Defence & Security Conference, Perth (25-26 August 2022)



INFORMING DETAILED DESIGN OF DIGITAL TWINNING CAPABILITY FOR THE ROYAL AUSTRALIAN NAVY

IMMERSIVE VIRTUAL REALITY

Partners:

- Maritime Support Branch, Royal Australian Navy (RAN), Department of Defence
- Defence Science Technology Group, Department of Defence
- Ventia



PROJECT SYNOPSIS

A Digital twin refers to a high fidelity virtual replica or representation of a physical object, system or process. Digital twins provide a comprehensive and dynamic digital counterpart of its physical counterpart, allowing real-time monitoring, detailed analysis and optimisation of the physical entity over its lifecycle.

The SIDTG undertook a two part-project in collaboration with the RAN to produce:

1. A structured report outlining digital twinning capability and opportunities for the RAN.

Outcomes of the report included:

- A taxonomy of digital twin-related terms and terminology most commonly used across industry specifically derived for consistent use across the Royal Australian Navy.
 - A taxonomy of active research areas within the Digital Twinning realm, relevant to maritime applications, along with the techniques and approaches being utilised to address these areas, as reported by the published literature.
 - A list of commercially available products and claimed associated features, mapped to the research taxonomy where possible, with relevance to Digital Twin capability with potential and/or perceived value for the Royal Australian Navy.
 - Opportunities for novel research and development for improved Digital Twin capability for specific use-cases to produce the greatest impact in Royal Australian Navy operations.
2. A pilot prototype digital twin system providing a technical demonstration of a visual and interactive 3D environment created from LiDAR scan data of a static space incorporating immersive visual display of sensory data (e.g. temperature, humidity).



Images are representative: sourced from Google Images

FORENSIC CRIME SCENE PHOTOGRAPHY TRAINING

IMMERSIVE VIRTUAL REALITY

PROJECT SYNOPSIS

Forensic photography is a critical undertaking in crime scene investigation, providing an accurate record of the initial appearance of a scene and capturing physical evidence in situ, helping the investigative team and juries piece together true versions of events. While forensic photography is a vital element of the criminal justice system, forensic photography is a highly advanced skill requiring integration of key photography principles and detailed sequencing of images to properly capture and preserve information.

Undergraduate students studying SCH2143 Forensic Skills currently practice their photography techniques in simulated crime scenes. These live simulations provide the students with a realistic representation of a crime scene. However, this exposure is the first time the students are able to practically apply the theoretical concepts of crime scene photography. With these limitations in mind, we have developed a virtual reality (VR) pre-training environment to allow for improved skill development and enhanced student learning in the essential skill of forensic photography. The digital sound and visual effects used in the VR environment creates an authentic experience which replicates the real-world setting, while providing a risk-free environment in which students can practice their skills.

PRESENTATIONS

- Australian and New Zealand Forensic Science Society (2022 - International)
- Australian and New Zealand Forensic Science Society (WA Branch) (2021)
- WA Learning and Teaching Forum (2020)
- WA Learning and Teaching Forum (2019)
- Australasian Society for Human Biology (ASHB) (2018)



SIDEFFECT GAMEPLAN

DESKTOP-BASED SERIOUS GAME



Partners:

- Sideeffect Australia (NGO; <https://sideeffect.org.au/>)
- University of Sunshine Coast
- Australian Council for Health, Physical Education and Recreation

PROJECT SYNOPSIS

Sideeffect GamePlan is an alcohol and other drug (AOD) education package that connects tailored learning activities and discussions with a gamified branching interactive narrative. The package is freely available for use in classrooms nationwide, providing schools with an easy-to-use, engaging resource for AOD education delivery, demonstrated to align with the Year 9 and 10 Health and Physical Education Australian curriculum.

The game component presents a multi-layered story explored through the choices of three characters, each revealing a different perspective following an incident at a house party. Accompanying learning modules engage students in meaningful conversations about AOD use, risk-taking behaviour, decision-making and harm reduction strategies. Features of this interconnected game/module include:

- Flexible delivery for educators, with up to six structured lessons available via a custom-built LMS;
- Teacher resources, instructions and worksheets aligned to in-game content, easily deliverable regardless of technology or content familiarity;
- A 'lesson mode' that simplifies delivery and accommodates differing lesson lengths;
- Repeatable, standardised lesson formats for use in classrooms, at home, or through remote learning.

ACCOLADES

- Merit Award Winner (runner-up); Australian Information Industry Association National iAwards, 2022 (Not-for-Profit/Community Solution category)
- Finalist; Australian Information Industry Association National iAwards, 2022 (Government & Public Sector Solution category)
- Winner; 31st West Australian Information Technology and Telecommunication Alliance INCITE Awards Winner, 2022 (Research & Innovation [Industry] Project of the Year category)
- Merit Award Winner (runner-up); 31st West Australian Information Technology and Telecommunication Alliance INCITE Awards, 2022 (Social Impact category)

PUBLICATIONS

- Nicholas J., Mills B., Hansen S., Bright S., Boyd H., Brook L., Watson J. & Hopper L. (2022) Developing an alcohol and other drug serious game for adolescents: Considerations for improving student engagement. *Australian & New Zealand Journal of Public Health*. Doi: 10.1111/1753-6405.13287
- Nicholas, J., Mills, B., Hansen, S., Bright, S., Scott, J., Ridout, I., Watson, J., Boyd, H., Brook, L., Hopper, L. (2023). Sideeffect GamePlan: Development of an alcohol and other drug serious game for high school students using a systematic and iterative user-centred game development framework. *Computers in Human Behavior*, xx(xx), 107774. <https://doi.org/10.1016/j.chb.2023.107774>.



GERM RTS (GENERAL EMERGENCY RESOURCE MANAGEMENT RESPONSE TRAINING SIMULATOR): GAMIFIED EDUCATION ENHANCING PANDEMIC PREPAREDNESS

DESKTOP-BASED SERIOUS GAME

Partners:

- South Metropolitan Health Service
- St John Ambulance WA
- Notre Dame University



PROJECT SYNOPSIS

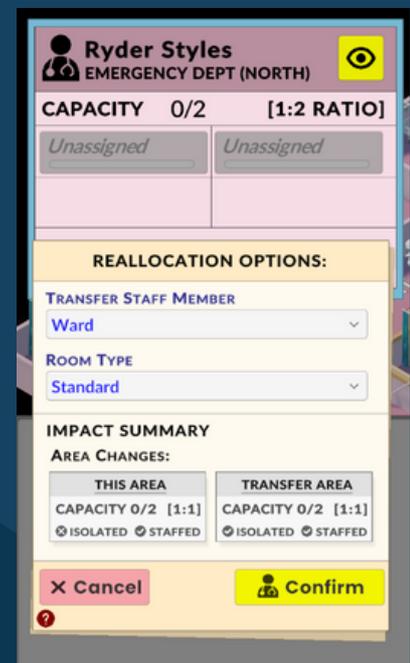
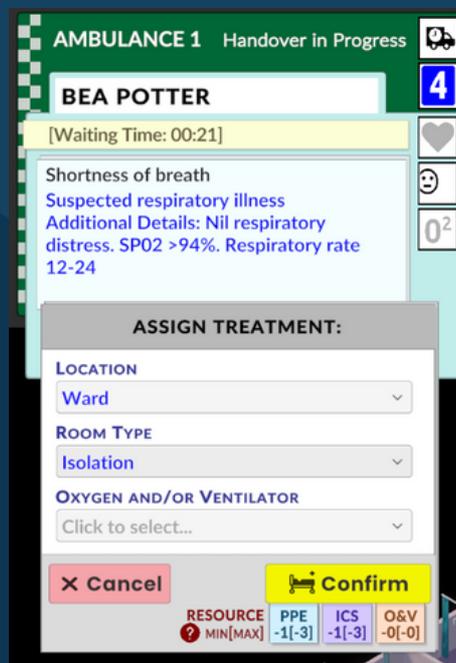
During the second wave of the pandemic in Australia, healthcare workers were more likely to be infected at work than in the community. Frontline healthcare workers were exposed to risk of infection with the virus, death of COVID-19 infected patients, fatigue, ethical dissonance in decision-making due to systemic and surge-related factors, and ongoing ambiguity regarding pandemic longevity. The pandemic demonstrated a need for adequate preparedness to alleviate resource scarcity and poor workforce management during surges. Pandemic planning and appropriate education are crucial in minimising risk of workplace infection.

This research program, funded by the WA Department of Health, designed, built and evaluated a game-based learning tool for frontline healthcare workers targeting identification of the elements involved in pandemic preparation, interdisciplinary cohesion and resource management during an evolving pandemic. Specific learning outcomes include:

- Formulating and implementing population-based triage at a hospital department level in response to an infectious respiratory disease outbreak.
- Identifying areas an interdisciplinary team response would provide benefit.
- Evaluating the impact of decisions made by clinicians during an infectious respiratory disease outbreak on the potential spread of disease on both local and wider healthcare system levels.

PRESENTATIONS

- Science on Swan, Perth (8–10 May 2023)



AUGMENTED REALITY CHILD HEALTH INTERACTIVE EXPERIENCE (ARCHIE)

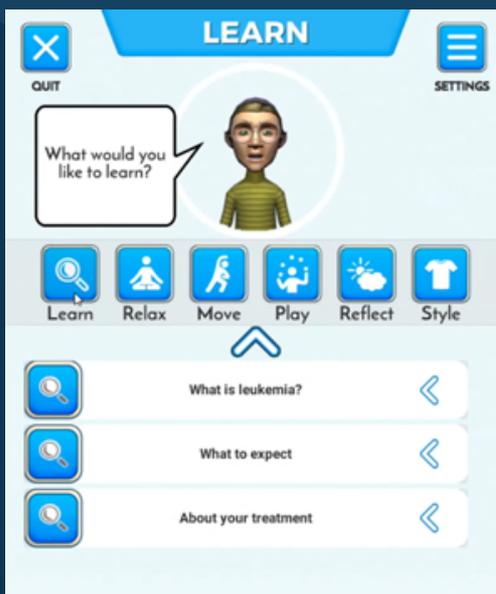
AUGMENTED REALITY

Partners:

- Perth Children's Hospital
- Telethon Kids Institute
- Redkite Australia (kids charity & family support)
<https://www.redkite.org.au/>

PROJECT SYNOPSIS

Receiving a cancer diagnosis is devastating. For children particularly, a cancer diagnosis can be substantially more difficult as it occurs at time in the lifecycle where coping and resilience features are underdeveloped. A new diagnosis of cancer can substantially drain and exhaust personal, psychological and social support resources for children and their families. Hospital admission itself removes children from their natural environment, separating them from family members, friends and schools. Unsurprisingly, childhood cancer patients and their families experience psychological distress including symptoms of anxiety and depression at rates far exceeding their healthy peers. Presentation of anxiety and depression as early as one-month post diagnosis can significantly increase the risk of symptom persistence throughout the first year of therapy. This highlights an important window of opportunity to not only identify early signs of anxiety and depression, but also provide psychological interventions and preventative strategies to reduce risk of mental health complications in this highly vulnerable group. In order to help children through their cancer diagnosis and treatment, we seek to design, build and trial an innovative and comprehensive therapeutic program for paediatric cancer patients. We will combine our knowledge of psychological therapeutic experiences for cancer treatments with digital gaming evidence, utilising augmented reality technology, to build ARCHIE (Augmented Reality Child Health Interactive Experience).



BIOGRAPHIES OF SIDTG MEMBERS

SCHOOL OF MEDICAL AND HEALTH SCIENCES



Dr Brennen Mills, PhD

Dr Mills is a Senior Lecturer and active researcher in Paramedical Science and Public Health in the SMHS at ECU. Dr Mills' background is in the development and evaluation of innovative technologies and high-fidelity simulation-based learning environments for education and training, with a focus on resilience building amongst healthcare professionals. This includes development and evaluation of novel pathways for augmented and virtual reality technology, and the potential impact on patient experiences and education and training. Dr Mills has extensive experience leading research and development user-centred design projects working alongside industry partners, including (but not limited to) the Department of Defence, Department of Education, WA Police, Department of Fire and Emergency Services, and WA Department of Health. Dr Mills also serves as the Chair of the ECU SMHS Ethics Subcommittee, and the ECU Early-Mid Career Research Network. He is also an executive committee member of the WA Country Health Service Human Research Ethics Committee and the WA Simulation in Healthcare Alliance.



Ms Sara Hansen, RN, MSN

Ms Hansen is the Simulation Education Coordinator within the SMHS at ECU. With a background in nursing, Ms Hansen develops and coordinates delivery of high-fidelity commercial simulation programs for courses in SMHS and a variety of industry partners including the Department of Health WA, the Australian Resuscitation Council, and the Australian Healthcare Practitioner Regulation Agency (AHPRA). Her focus centres on the development and application of immersive technologies to enhance quality and safety in healthcare and other high-risk industries.



Mr Wyatt de Souza, B. comm

Mr de Souza is a research assistant and virtual reality software developer. Mr de Souza has worked in both commercial and academic sectors developing virtual and augmented reality tools and simulations. He has worked on projects for clients such as the Department of Parks and Wildlife, Rio Tinto and Austin Engineering.



Ms Alecka Miles, Paramedic (Aphra), ACPM, MEH, PhD(c)

Ms Miles is a Lecturer within the SMHS and post-graduate course coordinator for the Master of Paramedic Practitioner course. Alecka is a Paramedic who has 15 years experience in Paramedicine including an extensive background in education for Student Paramedics (service and tertiary), Ambulance Volunteers, Career and Volunteer Firefighters and First Responders. Alecka is a passionate educator who has worked to improve the quality of pre-hospital care through many roles in the ambulance and emergency service industries as well as community education.



Mr Josh Johnson, B.S.c., PhD(c)

Mr Johnson is a Research Assistant within the School of Medical and Health Sciences at ECU. Mr Johnson graduated from a Bachelor of Science (Paramedical Science) in 2019 and is currently a PhD candidate. His research interests focus on utilising immersive technology to enhance training and safety in healthcare. Mr Johnson is currently involved in the creation of a virtual reality training program designed to support aggression and violence de-escalation training for front line emergency department workers and students.



Mr Sean Cashman, BA (Creative Industries)

Mr Cashman is a certified associate with Unity Technologies for the development of applications through the Unity game engine. He is also a sessional lecturer within the ECU SAH teaching game design. Mr Cashman has extensive experience in software development for serious games applications for education and training purposes.

BIOGRAPHIES OF SIDTG MEMBERS

WESTERN AUSTRALIAN ACADEMY OF PERFORMING ARTS



Dr Luke Hopper, PhD

Dr Hopper has extensive experience in managing international research and development projects in collaboration with community partners. Dr Hopper specialises in the analysis and visualisation of human movement using 3D motion capture. Dr Hopper has served on the board of the International Association of Dance Medicine and Science and the Australian Society for Performing Arts Healthcare. In his position at ECU, Dr Hopper is developing a health education and research program with the aim of preventing injury and illness in performing artists.



Ms Jessica Watson, BSc (Psych), BCI

Ms Watson is a Senior Research Assistant and Motion Capture Technician at the Western Australian Academy of Performing Arts. She specialises in the use of motion capture to record the real-world performances of actors and dancers, for the creation of interactions in applied games, virtual reality, and augmented reality simulations. In addition to her motion capture work, Ms Watson has extensive experience in game development for commercial, independent and educational interactive projects.



Michella Hill, M.S.c., PhD(c)

Ms Hill is a Research Associate within SIDTG and PhD candidate in Paramedicine ECU. Her current research focuses on out-of-hospital births in paramedic care. She is designing a virtual reality training program for paramedics and students to increase their exposure and confidence with these low frequency-high risk situations and improve patient outcomes. Following a Bachelor of Science (Paramedicine), she completed her Masters by Research project entitled "Dr Google", which reviewed online symptoms checkers accessible to the Australian public. Ms Hill is a registered, non-practicing paramedic planning to become an early-career researcher focusing on improving pre-hospital care.

SCHOOL OF SCIENCE



A/Prof Martin Masek

Dr Masek is an Associate Professor of Computer Science in the School of Science at ECU. His research is on the application of artificial intelligence, image processing, and real-time interactive simulation techniques to solve problems in the domains of health, education and defence. Dr Masek also has an extensive background in the research and development of gaming technology for education and training purposes.



Mr Jake Snell, BCS

Mr Snell is a Research Assistant within the School of Science at ECU where he lends his expertise on 3D visualisation and AI to immersive digital technology projects. Jake has a Bachelor of Computer Science and Games Programming, and has worked as a software developer in the finance industry.

SCHOOL OF EDUCATION



Dr Julie Boston, PhD

Dr Boston is a Senior Lecturer and the Academic Coordinator of Industry Engagement and Partnerships for the School of Education at ECU, responsible for identifying, establishing and managing educational partnerships and enterprise related programs that drive strategic priorities for ECU. Dr Boston has an extensive background in education and pedagogy, leading research and development projects with a focus on the use of gaming and immersive technologies to support learning and teaching.

SCHOOL OF ENGINEERING



Dr Alex Rassau, PhD

Dr Rassau is a Senior Lecturer and discipline coordinator for Electrical Engineering in the School of Engineering at ECU. His research interests include intelligent control, machine learning, neuromorphic systems, automation and robotics, 3D scanning, digital twinning and immersive technologies, and their application to enhance learning. Dr Rassau applies virtual and simulated environments into his research into robotic scene understanding and teleoperation enhancement.

FUNDED PROJECTS

- (2023–2024) Emotional Literacy Mindfulness Academy (ELMA) evaluation amongst young children in schools. (ELMA Education Pty Ltd), \$47,086
- (2023) Informing Detailed Design of Digital Twinning Capability for the Royal Australian Navy. Defence Science Technology Group, Australian Government Department of Defence, \$168,772
- (2022–2024) Investing in your bones: supporting lifelong health and performance, Arthritis Foundation of WA, Grant, 2022 - 2024, \$292,694
- (2021–2023) Novel development of a serious game targeting preparedness of clinician response to operations during the COVID-19 pandemic (WA Department of Health), \$224,449
- (2021–2023) Virtual reality-enhanced tactical parachute training (Department of Defence), \$346,145
- (2021–2023) Development and evaluation of a novel obstetrics training program leveraging virtual reality technology for paramedics, volunteer ambulance officers and paramedic students (St John Ambulance WA), \$49,658
- (2021) Informing Detailed Design of Emergency Management and Response Virtual Simulation for the Western Australian Emergency Management Training Centre (Department of Fire and Emergency Services), \$53,702
- (2020–2023) The development of online, gamified substance awareness educational content (Sideeffect Australia; Australian Council for Health, Physical Education and Recreation), \$690,859
- (2020–2023) Using virtual reality to create novel metrics of expertise in safety-critical decision making (Defence Science and Technology Group of the Department of Defence, Defence Research Network for Undersea Decision Superiority), \$185,357
- (2020–2022) Early identification of and appropriate response to aggressive behaviour for hospital workers (WA Department of Health), \$49,853
- (2019) Opening new choreographic opportunities through 3D virtual dancers performing in mixed reality (Department of Local Government, Sport and Cultural Industries), \$35,000
- (2019) Augmented Reality Child Health Interactive Experience: A digital gaming platform for paediatric oncology patients to reduce hospitalisation/treatment-related anxiety and depression (Perth Children's Hospital; Telethon Kids Institute), \$29,600
- (2018) Utilising Virtual Reality to enhance student learning in the forensic environment (WA Police), \$5,000
- (2017–2018) The application of virtual reality to train and prepare paramedics for mass/multi casualty incidents (St John Ambulance WA), \$74,700

HIGHER DEGREE RESEARCH STUDENT PROJECTS

PhD

- Aggression and violence de-escalation training using virtual reality technology for front line emergency department healthcare professionals and students
- Out-of-hospital immersive birthing simulation training for paramedics and ambulance officers using virtual reality technology

Masters by Research

- Efficacy of smart-bag ventilations compared to standard adult and paediatric bag-valve ventilations during cardiopulmonary resuscitation
- Operational preparedness for medical management of major incidents: A comparison of traditional and digital mass casualty training modalities for out-of-hospital responders
- Pilot evaluation of a novel pandemic preparedness serious game for nurses and nursing students
- The use of simulation-based learning experiences to decrease anxiety and increase confidence and preparedness for clinical placements for speech pathology students

RECENT SIDTG PEER-REVIEWED PUBLICATIONS

- Nicholas, J., Mills, B., Hansen, S., Bright, S., Scott, J., Ridout, I., Watson, J., Boyd, H., Brook, L., Hopper, L. (2023). Sideeffect GamePlan: Development of an alcohol and other drug serious game for high school students using a systematic and iterative user-centred game development framework. *Computers in Human Behavior*, xx(xx), 107774. <https://doi.org/10.1016/j.chb.2023.107774>.
- Hill, M., Smith, E., Mills, B. (2022). Work-based concerns of Australian frontline healthcare workers during the first wave of the COVID-19 pandemic. *Australian and New Zealand Journal of Public Health*, 46(1), 25–31. <https://doi.org/10.1111/1753-6405.13188>.
- Hill, M., Miles, A., Flanagan, B., Mills, B., Hopper, L. (2022). Out-of-hospital births and the experiences of emergency ambulance clinicians and birthing parents: a scoping review protocol. *BMJ Open*, 12(5), article number e062313. <https://doi.org/10.1136/bmjopen-2022-062313>.
- Mills, B., Hill, M., Miles, A., Smith, E., Afrifa-Yamoah, E., Reid, D., Rogers, S. & Sim, M. (2022) Calling an ambulance for non-emergency medical situations: Results of a cross-sectional online survey from an Australian nationally representative sample. *Emergency Medicine Australasia*. Doi: 10.1111/1742-6723.14086
- Hill, M., Flanagan, B., Mills, B. & Hopper, L. (2022) Paramedic training, experience, and confidence with out-of-hospital childbirth (OOHB) in Australia. *Australasian Emergency Care*. Doi: 10.1016/j.auec.2022.08.008
- Nicholas J., Mills B., Hansen S., Bright S., Boyd H., Brook L., Watson J. & Hopper L. (2022) Developing an alcohol and other drug serious game for adolescents: Considerations for improving student engagement. *Australian & New Zealand Journal of Public Health*. Doi: 10.1111/1753-6405.13287
- Hill, M., Miles, A., Flanagan, B., Mills, B. & Hopper, L. (2022) Out-of-hospital births and the experiences of emergency ambulance clinicians and birthing parents: a scoping review protocol. *BMJ Open*. 12:e062313
- Mills, B., Hill, M., Miles, A., Smith, E., Afrifa-Yamoah, E., Reid, D., Rogers, S. & Sim, M. (2022) Ability of the Australian general public to identify common emergency medical situations: Results of an online survey of a nationally representative sample. *Australasian Emergency Care*. Doi:10.1016/j.auec.2022.04.002
- Spring-Walsh, B., Gardiner, F., Bloxsome, D., Ford, D., Mills, B., Laws, S. (2022) A cohort comparison study on women in threatened preterm labour given Nifedipine or Nifedipine and Salbutamol tocolysis in aeromedical retrieval. *Air Medical Journal*. 41:3, 298–302
- Smith, E., Holmes, L., Larkin, B., Mills, B. & Dobson, M. (2022) Supporting volunteer firefighter wellbeing: Lessons from the Australian 'Black Summer' bushfires. *Prehospital and Disaster Medicine*. 1-4. Doi:10.1017/S1049023X22000322
- Hill, M., Smith, E. & Mills, B. (2022) Work-based concerns of Australian frontline healthcare workers during the first wave of the COVID-19 pandemic. *Australian and New Zealand Journal of Public Health*. 46:1, 25–31.
- Hill, M., Smith, E. & Mills, B. (2021) Willingness to work amongst Australian frontline healthcare workers during Australia's first wave of COVID-19 community transmission: Results of an online survey. *Disaster Medicine and Public Health Preparedness*. 1–7. Doi: 10.1017/dmp.2021.288.
- Smith, E., Hill, M., Anderson, C., Sim, M., Miles, A., Reid, D. & Mills, B. (2021) Lived experience of emergency healthcare utilization during the COVID-19 pandemic: A qualitative study. *Prehospital and Disaster Medicine*. 36:6, 691–696.
- Bartlett, D., Hansen, S., Cruickshank, T., Rankin, T., Zaenker, P., Mazzuchelli, G., Gaston, M., Du Ploy, D., Minhaj, Z., Errey, W., Rumble, T., Hay, T., Miles, A. & Mills, B. (2021) Effects of sleepiness on clinical decision making amongst paramedic students: a simulated night shift study. *Emergency Medicine Journal*. 39:1, 45–51.
- Anderson, C., Pooley, J., Mills, B., Anderson, E. & Smith, E. (2020) COVID-19: Do paramedics have a professional responsibility to work during a pandemic? A qualitative exploration of community member expectations. *Disaster Medicine and Public Health Preparedness*. 14:3, 406–412.
- Mackinnon, K., Everett, T., Holmes, L., Smith, E. & Mills, B. (2020) Risk of psychological distress, pervasiveness of stigma and utilisation of support services: Exploring paramedic perceptions. *Australasian Journal of Paramedicine*. 17. Doi: 10.33151/ajp.17.764.
- Ford, D., Mills, B., Ciccone, N. & Beatty, S. (2020) Does Direct Helicopter Retrieval Improve Survival of Severely Injured Trauma Patients from Rural West Australia? *Air Medical Journal*. 39:3, 183–188.
- Miles, A., Hansen, S. & Mills, B. (2020) A simulated night shift for undergraduate paramedicine students: Lessons learnt and the perceived value towards learning. *Australasian Journal of Paramedicine*. 17. Doi: 10.33151/ajp.17.732.
- Mills, B., Dykstra, P., Hansen, S., Miles, A., Rankin, T., Hopper, L., Brook, L. & Bartlett, D. (2020) Virtual reality triage training can provide comparable simulation efficacy for paramedicine students compared to live simulation-based scenarios. *Prehospital Emergency Care*. 24:4, 525–536.
- Mills, B., Hansen, S., Nang, C., McDonald, H., Lyons-Wall, P., Hunt, J. & O'Sullivan, T. (2019) A Pilot Evaluation of Simulation-Based Interprofessional Education for Occupational Therapy, Speech Pathology and Dietetic students: Improvements in Attitudes and Confidence. *Journal of Interprofessional Care*. Doi: 10.1080/13561820.2019.1659759

RECENT ACCOLADES

IVADE: IMMERSIVE VIOLENCE & AGGRESSION DE-ESCALATION EXPERIENCE FOR FRONTLINE HEALTHCARE PROFESSIONALS

- Winner; 32nd West Australian Information Technology and Telecommunication Alliance INCITE Awards, 2023 (Innovating Government)
- Finalist; 32nd West Australian Information Technology and Telecommunication Alliance INCITE Awards, 2023 (Research and Innovation Project [Industry])
- Finalist; Australian Information Industry Association National iAwards, 2023 (Government/Public Sector)

SIDEFFECT

- Merit Award Winner (runner-up); Australian Information Industry Association National iAwards, 2022 (Not-for-Profit/Community Solution)
- Finalist; Australian Information Industry Association National iAwards, 2022 (Government & Public Sector Solution)
- Winner; 31st West Australian Information Technology and Telecommunication Alliance INCITE Awards Winner, 2022 (Research & Innovation [Industry] Project of the Year)
- Merit Award Winner (runner-up); 31st West Australian Information Technology and Telecommunication Alliance INCITE Awards, 2022 (Social Impact)

ENHANCING PREPAREDNESS TO MASS CASUALTY INCIDENT RESPONSE FOR EMERGENCY RESPONDERS

- Winner; ACS Digital Disruptor Awards Finalists, 2019 (Skills Transformation of Work Teams (Large))
- Winner; 28th West Australian Information Technology and Telecommunication Alliance INCITE Awards, (Most Transformative Impact on Education)
- Winner; Vice Chancellor's Inspiring Staff Award, Teams
- Finalist; Serious Games Showcase and Challenge Australasia
- Finalist; Australian Information Industry Association National iAwards (Community & Consumer Markets)
- Finalist; 28th West Australian Information Technology and Telecommunication Alliance INCITE Awards (Most Innovative Enabler in Health Care)

MEDIA RESOURCES

SIDEFFECT

- Project synopsis - <https://www.youtube.com/watch?v=7SCVdqgZTe8> (2 mins 10 secs)
- Game trailer - <https://vimeo.com/691354240> (4 mins)
- Mock classroom teacher facilitation - <https://vimeo.com/691347040> (2 mins 51 secs)
- Mock classroom student responses - <https://vimeo.com/691349536> (1 min 39 secs)
- Split screen video - <https://vimeo.com/693055321> (58 secs)
- Interview Dr Ian Lillico - <https://vimeo.com/691358749> (1 min 57 secs)

IVADE: IMMERSIVE VIOLENCE & AGGRESSION DE-ESCALATION EXPERIENCE FOR FRONTLINE HEALTHCARE PROFESSIONALS

- Ch 7 News - <https://www.youtube.com/watch?v=kVYbZn9K-1k> (1 min 53 secs)
- Program showcase and description - <https://www.youtube.com/watch?v=AChSSBkZyXI> (1 min 32 secs)
- Trailer - <https://www.youtube.com/watch?v=kliJEp4cRE8> (1 min 51 secs)
- Motion Capture - <https://www.youtube.com/watch?v=sxIKu6V9EUQ> (53 secs)
- Character creation - <https://www.youtube.com/watch?v=loz87vRj9SU> (1 min)
- Short summary - <https://www.youtube.com/watch?v=6TBmAe3uwU8> (45 secs)
- VR game trial playthrough - <https://vimeo.com/764094865> (49 secs)

ENHANCING PREPAREDNESS TO MASS CASUALTY INCIDENT RESPONSE FOR EMERGENCY RESPONDERS

- Ch 9 News - <https://www.youtube.com/watch?v=AROWP4GLFEU> (2 mins 42 secs)
- Ch 7 News - https://www.youtube.com/watch?v=_ZyA7cWKZ9E&feature=youtu.be (1 min 36 secs)

PARAVERSE: TACTICAL PARACHUTE TRAINING FOR DEFENCE PERSONNEL

- First-person perspective - <https://vimeo.com/764099397> (1 min 2 secs)
- Third-person perspective - <https://vimeo.com/764100750> (58 secs)

AUGMENTED REALITY CHILD HEALTH INTERACTIVE EXPERIENCE (ARCHIE)

- ARCHIE Project Overview - <https://vimeo.com/693960415> (1 min 59 secs)
- ARCHIE Project Run-through - <https://vimeo.com/693894133> (6 mins 3 secs)