

**GAMES  
FOR  
CHANGE**

**ASIA-PACIFIC  
JOURNAL  
VOLUME 1: 2021**

EDITED BY:  
VIKTOR ARITY  
DALE LINEGAR  
STEFAN SCHUTT  
GILLIAN VESTY

## Games for Change Asia-Pacific Journal

---



# *Games for Change Asia-Pacific Journal*

---

VIKTOR ARITY, DALE LINEGAR, STEFAN SCHUTT &  
GILLIAN VESTY

Carnegie Mellon University: ETC Press  
Pittsburgh, PA

---



Games for Change Asia-Pacific Journal by Carnegie Mellon University: ETC Press is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, except where otherwise noted.

Copyright © by ETC Press 2021 <http://press.etc.cmu.edu/>

ISBN: 978-1-7948-8799-2 (Print)

ISBN: 978-1-7948-8341-3 (Digital)

The text of this work is licensed under a Creative Commons Attribution, NonCommercial–NonDerivative 4.0 License (<http://creativecommons.org/licenses/by-nc-nd/2.5/>).

IMAGES: All images appearing in this work are property of the respective copyright owners, and are not released into the Creative Commons. The respective owners reserve all rights.

For information and formatting guidelines, see: <http://todigra.org/index.php/todigra/about/submissions>

# Contents

|   |     |
|---|-----|
| Introduction  | 1   |
| Why is there such resistance to playing with learning?<br>Elyssebeth Leigh  | 5   |
| Practicing to become a teacher: learning from<br>simulations and roleplays<br>Anne Southall, Stefan Schutt, Rebecca Miles-Keogh, Adam Staples &<br>Steve Murphy                                       | 23  |
| Using serious games to foster wellbeing literacy in<br>higher education students<br>Nancy An, Gillian Vesty, Chris Cheong & Pavithra Siriwardhane   | 45  |
| TALi DETECT: a serious game for the assessment of<br>early childhood attention<br>Simone Gindidis & Azadeh Feizpour   | 55  |
| The Rosetta Wheel: a framework for designing<br>behaviour change games<br>Jane H Cocks, Colleen Stieler-Hunt & Christian M Jones  | 67  |
| Differential exercise patterns between 'hardcore' and<br>'casual' players of Pokémon GO and Harry Potter:<br>Wizards Unite<br>Kathleen Yin, Matthew D. Lee, Kiran Ijaz, James Smith & Louise A. Ellis | 99  |
| Making videogames more inclusive for people living<br>with MND: protocol for a scoping review<br>Ben O'Mara, Matthew Harrison, Natasha Dwyer & Kirsten Harley   | 127 |

|   |     |
|---|-----|
| Opening The Door in Question: simulating schizophrenia and psychosis in XR and transmedia experiences<br>Troy Rainbow                   | 147 |
| Mental Jam: video game co-creation for young people with lived experiences of depression and anxiety<br>Hsiao-Wei Chen                  | 177 |
| A qualitative interview study of stakeholder use of Vaxcards in schools<br>Daniel Stewart Epstein, Melis Selamoğlu & Christopher Barton | 205 |
| About the ETC Press   | 219 |

# *Introduction*

The inaugural Games for Change Asia-Pacific Festival, held in October 2021, hosted over one hundred exciting presentations from throughout the Asia-Pacific region. With a population of over four billion people, this region represents over half the world and is home to a vibrant mix of cultures and peoples that engage with games in their everyday lives. Throughout the region, innovative and thoughtful work is constantly being done to design innovative games for learning, health and social change – but this work is not always visible to people in the region or other parts of the world. This is what the new Asia-Pacific chapter aims to change. The festival exists to highlight these innovations, to connect game developers, researchers, practitioners and players, and to inspire the next generation of literal game-changers. Correspondingly, this journal has been established for the complementary purpose of highlighting the important research that informs and illuminates the work of those presenting at the festival as well as their peers.

Games for Change Asia-Pacific stands on giant shoulders. Since 2004 the Games for Change (G4C) organisation has operated out of New York, with regional chapters in Latin America and Europe. G4C's mission is to foster the development and awareness of games and interactive technologies that make the world a better place. Research plays an important role in this mission, as the evidence generated from such research can serve to guide the ways in which games might be used for aims other than (or, in some cases, additional to) consumer entertainment.

For this first issue of the Games for Change Asia-Pacific journal, the editorial board has identified a collection of ten thought-provoking papers



that showcase a diverse range of game types, subject areas and frameworks. Some report on custom-designed games (or plans for them) and the theoretical, clinical or personal approaches that have informed their development. Others describe how existing commercial games are being used in ways that positively impact people's mental or physical health. One describes the therapeutic use of the game creation process itself. A number focus on mental health and wellbeing, others on education and clinical practice. All, however, are valuable and revealing, and enrich our understanding of the ways in which games can make a contribution to our lives.

We lead this issue with a paper by Elysebeth Leigh, winner of Simulation Australasia's Ray Page Lifetime Achievement Award for her tireless work in promoting serious games and simulations. Leigh sets the scene for the issue by presenting an analytical framework for understanding why serious games, and play in general, continue to not be taken seriously enough by educators. Personal in tone and informed by decades of experience, Leigh traces her own history with educational trends and dogmas since the 1960s, including the formative experience of losing her teaching position and ending with advice on how to help teaching peers make the leap to using games in their practice.

A paper follows that also looks at teachers and teaching. Anne Southall, Stefan Schutt, Rebecca Miles-Keogh, Adam Staples and Steve Murphy examine teacher education and the ways in which 'approximations of practice' usually undertaken in school placements by student teachers could be achieved in more targeted ways through deployments of digital simulations and role plays that are informed by practice theory. An initial pilot case study is described and comparisons are made to the field of health care, which has long used simulations and role plays – both through the use of technology and trained actors.

In another area of education, and with a focus on motivating resilience and wellbeing, Nancy An, Gillian Vesty, Chris Cheong and Pavithra Siriwardhane outline the use of a serious game of ethical decision making, Bogart, that helps business students deal with challenging workplace situations. They argue that practicing wellbeing literacy through the alternative journeys modelled in the serious game will help students understand the

ramifications of choices they make when they respond to ethical dilemmas. The ability to build resilience through repeated game play experimentation is an important design feature of serious games and an essential pedagogical tool for work integrated learning.

Another custom-designed game environment is the subject of the next paper by Simone Gindidis and Azadeh Feizpour, but this time with the early years in mind. It introduces a series of serious games called TALi DETECT that are designed to assess the development of cognitive attention in children aged from four to seven years old. TALi DETECT is presented as a validated form of Software as a Medical Device (SaMD), a colourful, vibrant and engaging digital App that spans the worlds of research and clinical practice.

A recurring theme of this issue was the promotion of physical or mental health through games. Jane Cocks, Colleen Stieler-Hunt and Christian Jones take an approach that is both conceptual and practical by presenting a detailed framework for designing games for health behaviour change. Developed through the integration of research and practice, this framework offers useful tools and advice for designers and developers of games for health.

The following two papers report on how pre-existing consumer games can be used to improve the lives and health of young people. Kathleen Yin, Matthew Lee, Kiran Ijaz, James Smith and Louise Ellis discuss their research into the divergent ways in which augmented reality games Pokémon GO and Harry Potter: Wizards Unite can encourage people to undertake outdoor exercise, highlighting the influence of game design and player type on specific 'exergame' effects.

Ben O'Mara, Matthew Harrison, Natasha Dwyer and Kirsten Harley then present a plan for a scoping review on the impediments to video game use by people living with motor neurone disease. Here the focus is on barriers experienced by a segment of the population in relation to an activity that most others take for granted – game playing as recreation. This paper makes the important observation that the productive use of games includes entertainment for socialisation and wellbeing, especially by people who are locked out of other forms of interaction and play.

There are two important papers in this publication that report on games as tools for understanding the experiences of others living with mental health issues. Researcher and artist Troy Rainbow discusses the simulation of experiences of schizophrenia and psychosis through Extended Reality, described as encompassing 360-degree film, and forms of mixed reality, as well as stories told simultaneously across a range of media forms including live theatre and digital media. Informed by his own family experiences, Rainbow outlines a number of ideas for using forms of 'technodramaturgy' to generate a greater sense of empathy with people experiencing schizophrenia and psychosis.

Michelle Chen's contribution to this volume takes a different approach but with some aligned aims – how guided game creation with young people experiencing anxiety and depression can serve as community awareness raising, as well as an empowering form of self-expression. Chen describes the ways in which games creation workshops have led to positive outcomes for both game creators and players of the games who gain a deeper understanding of the lived experiences of others.

Lastly, and reminding us that not all games are played on computers, Dan Epstein outlines the deployment of a collectable card game Vaxcards to address a topical theme at the time of writing – vaccine hesitancy. Epstein's paper reports on the experiences of Year Seven school stakeholders students who used Vaxcards as part of a school vaccination program.

Together these articles showcase insights from experienced and emerging game-based educators, enthusiasts and researchers who, like us, note the potential of games in dealing with some of the world's wicked problems. We are encouraged by the creative yet rigorous ways in which the authors have positioned games, and game making, as a force for good in human society, and the practical advice and collaborative spirit they offer. Given that this is only the first issue of our new journal, we can't wait to see what future issues will bring.

# *Why is there such resistance to playing with learning?*

ELYSSEBETH LEIGH

## ABSTRACT

---

Games for change – and learning – are here to stay. But uptake by educators at school and tertiary levels remain lower than it could be.

This article explores a daunting list of inhibiting factors that reduce the chances of games becoming more widely adopted as educational methods. Such factors have been documented since the 1960's and apparently remain as unyielding in their resistance to the notion of playing to learn as when they were first identified.

So, the urgent question for proponents of using concepts of play – including simulation, games and virtual reality as examples – is why this state of affairs has remained static for so long. And there is the consequent question of what such proponents need to do to help educators make the 'seismic' shift from resistance to adoption of games for learning? Existing barriers to playful engagement with learning can be reduced over time and will involve sustained action by individuals and/or organisations to increase playfulness in learning environments.

## INTRODUCTION

---

There is a clear distinction – however unfortunate – to be made between

informal and formal learning environments. While it is acknowledged that children learn through experimenting with their environment, and that play is their chief way of doing so, formal learning environments continue to resist its use. Similarly, the capability of human beings to test out behaviour in the relative safety of 'play' is widely understood, however formal education environments habitually separate 'play' from 'learning' in ways that dismiss the potential of play, and often strenuously resist the idea. And the continuing puzzle is why this is so.

Children use play as experimentation, trial and error, as mimicry to rehearse behaviours they foresee needing to understand, as a means of relieving tension and assist in learning to cope with unfamiliar and even fearful situations. Play can help with exploring and stretching the boundaries of the known and familiar through imitation of social themes and even achieving understanding of what constitutes 'good' and 'bad', which, in themselves are cultural constructs so deeply embedded as to be difficult to reach. The fun of play contributes enjoyment of life, and awareness of self in context – thus the schoolyard is often rather *apparent* confusion than *real* chaos; and, as children, we understand how playful learning helps us to handle mystery and fear, uncertainty and non-replicable events.

However, as adults we somewhat mysteriously lose that insight and move instead to distancing ourselves as 'child' from ourselves as 'adult' as exemplified in a passage from one of Paul's letters to the Corinthians, which is often quoted when people disapprove of levity in learning contexts:

*When I was a child I spake as a child, I understood as a child, I thought as a child; but when I became a man I put away childish things.*

*For now we see through a glass darkly, but then face to face; now I know in part; but then I shall know even as also I am known. (1 Corinthians ch.13 v 1 in OUP, 1996)*

Such an approach implies the need for adult seriousness in all things – whatever that may mean to specific individuals. This urgent 'need' for seriousness can readily be identified in the overwhelming reliance on 'teaching' to induce 'learning' in formal educational settings.

Children, having no need for such formality, joyfully create learning environments that integrate acquisition of required knowledge into activities copying aspects of the adult world they know they must enter, but find mysterious and even fearful. Child's play does not attempt to model life in realistic detail, nor does it overtly include 'lessons' to be learned; however, despite children considering only that they are 'playing' and enjoying the moment, the 'lessons' they are learning are subtle and profound. I am strongly in favour of educators looking at children's engagement with learning as they play and then taking the time to figure out all the possible ways of taking that into the ways we arrange our own knowledge-driven environments. Notice I am avoiding use of the term 'teaching' here, as I strongly agree with Professor Jerry Harvey (1999) who agrees with Carl Rogers that *nothing of value can be taught but much of value can be learned*.

Simulations and games offer both learning and fun in abundance so why are the barriers I am about to discuss still so prevalent, and what can be done about that? One step is to acknowledge that it is time to re-write that message to the Corinthians along the lines of:

*When I was a child I spake as a child, I understood as a child, I thought as a child; but when I became an adult I have learned how to put 'childish' things to new, complex and engaging uses.*

While play has long been acknowledged as part of early childhood learning it seems that we become concerned by conformity, standards and even motivation to learn. After joyfully describing the adventures of a 16 month old toddler learning about things around her, John Holt noted (1972, p. 17)

*It is hard not to feel that there must be something very wrong with much of what we do in school, if we feel the need to worry so much about ...motivation.*

I am raising these points on my way to examining a current list of barriers – and their actual or supposed – underlying causes, because I want to be explicit about the fact that opposition to playfulness in formal education contexts is a very old phenomenon. And I am certain that if proponents of the playfulness inherent in games and simulations for learning are going to move the 'learning game' *forward* – meaning away from – endless seriousness then we need a much better awareness of the barriers ahead.

## TEACHING AND LEARNING IN THE 1960'S

---

I am focusing on the period from the 1960's to the present because it spans my own learning experiences, so I can speak personally about them, as well as considering what is – and was – being researched and published about education and the use of games. I am also acutely aware that everything I draw on has antecedents, some of which I may know, while others may prove to be factors you choose to recall for yourselves and may even be recalled differently by you.

I was a wilful child in a small country school where almost everything was taught by rote, because – for the pitifully few teachers – that was the only way of controlling their large classes. At least that is how I thought about those years until much, much later. Through those years I 'learned' to despise rote-memorisation because I was never very good at it. However, I loved learning because I was interested in connections and relationships among ideas. I could not get enough of it and became a high school teacher.

However, I could not in conscience, use those content-driven 'teaching' processes and plunged full tilt into alternative strategies that lessened my 'authority' as a teacher while increasing learner engagement by bringing the real outside world into the classroom. The logic of such a strategy seemed unassailable – but it wasn't. In my second year of teaching I lost my job and began learning about the complexities of society's relationships with education. I battled for three years to overturn that decision but by the time the 'war' was won I knew I would never again teach in a formal schooling environment. So, what did I learn from that unfortunate career beginning? Lesley Wilson has developed a great summary of what I needed know and Table 1 (Leigh & Leveque, 2021) arranges her insightful list of curricula into clusters for easier reference. In the years since that unfortunate – but perhaps most fortunate – beginning I have spent the remainder of my working life learning about, designing and using simulations and games for learning.

|   |   |
|---|---|
| <b>(Source is) INSTITUTIONAL</b>          |   |
| Overt, explicit, or written curriculum    | Written /produced documents chosen to support an institution’s intentional instructional agenda.  |
| Rhetorical curriculum                     | Ideas offered by policymakers, school officials, administrators, or politicians.  |
| <b>(Source is) - TEACHER</b>              |   |
| Curriculum-in-use                         | The actual curriculum as delivered and presented by each teacher  |
| <b>(Source is) - STUDENT</b>              |   |
| Received curriculum                       | Those things that students actually take out of the classroom   |
| Internal curriculum                       | Processes, content, knowledge combined with the experiences and realities of the learner to create new knowledge. Educators have little control over the internal curriculum since it is unique to each student.  |
| <b>(Source is) - INVISIBLE</b>            |   |
| The hidden or covert curriculum           | It may include both positive or negative messages, depending on models enacted and learner perspectives. .. <i>derived from the very nature and organizational design of the [institution], as well as behaviors and attitudes of teachers and administrators.</i> (Longstreet & Shane, 1993 p46) |
| The null curriculum                       | All that is <b>not</b> taught, thus conveying the message that these elements are not important in their educational experiences or in our society. <i>What students cannot consider ... they are unable to use, [which has] consequences for the kinds of lives they lead.</i> (Eisner 1993)     |
| Phantom curriculum                        | The messages prevalent in and through exposure to any type of media can play a major part in enculturation of students into a predominant meta-culture, or narrower or generational subcultures.  |
| The electronic curriculum                 | Those lessons learned through searching the Internet for information, or through using e-forms of communication   |
| <b>(Source is) - COMMUNITY</b>            |   |
| Societal curriculum (or social curricula) | <i>The massive, ongoing, informal curriculum of family, peer groups, neighborhoods, churches, organizations, occupations, mass media, and other socializing forces that “educate” all of us throughout our lives</i> (Cortes, 1981 p24)   |
| Concomitant curriculum                    | What is taught, or emphasized at home - may be received at church, in the context of religious expression, lessons on values, ethics or morals, etc. based on the family’s preferences  |

Table 1: Types of curricula influencing learning (based on Wilson, 2020)

I now know that – in acting as I did and thereby losing my job – I violated the underlying values of several items on Wilson’s list. I did work to the overt/written curriculum but violated the rhetorical curriculum by using methods not sanctioned by those ‘guarding’ it. I (inadvertently I must add) revealed the hidden curriculum as being bounded by the rationalities of a time and place with which I was unfamiliar, and in doing so challenged the beliefs of those guardians about its ‘rightness’. I included items from the ‘null’ curriculum in class work, and in doing so again challenged the ‘guardians’. I’m sure you are seeing the picture by now. My focus was ensuring the ‘received’ and ‘internal’ curricula as taken away by the learners



would be consistent with their lived experiences beyond the large brick buildings where we congregated each day. In fact, that is still my practice. But wisdom comes with adversity, and I learned enough from those early lessons to understand that all these curricula co-exist and that it is their interplay that determines our daily experiences.

## FINITE AND INFINITE GAMES

---

The philosopher James Carse has helpfully identified the two types of game being played at that school – he calls them Finite games and Infinite games. As a new young teacher, I thought I was free to play the Infinite game wherein I could *play with the rules* of education to give the learners their best chance of future success. Instead, I was in a context where only Finite games could be played. I was supposed to *play by the rules* which had been firmly established in that context and was not supposed to upset the status quo – which I did repeatedly albeit unknowingly. Little wonder that my ‘three years in the wilderness’ were so swiftly mandated. However, the playfulness of the Infinite game has brought me here today – where I can choose to play either game as needed by the context. This framework for understanding the interactions within specific contexts is especially useful for those hoping to encourage other educators to adopt play as a learning tool. We all need to know how to use the framework to analyse immediate contexts when deciding which of the two games is in play at any moment. A summary of the key features of each type of game is in Table 2:

| Finite Games  | Infinite Games  |
|---|---|
| • plan to win   | • play to continue playing                                |
| • ends when someone wins                                  | • rules are internally defined                            |
| is bounded by defined rules(temporal, spatial, numerical) | play with ( not within) boundaries of time space, numbers |
| requires other players, known as opponents                | no questions of eligibility about who can play            |
| the player as seeker of titles recognised by society      | the player as artist, creator, innovator                  |
| there are many finite games to play                       | there is only one infinite game                           |

*Table 2: Key characteristics of Finite and Infinite Games (based on Carse, 2013)*

I now know that I did not learn those early lessons as well as I could have, and in the late 1990's I found myself again facing disaster. This time I did not lose my job – but instead took on the even greater challenge of completing a doctoral research program (Leigh, 2003). In effect, this time I chose to play the Infinite Game deliberately – and ‘play with’ all the knowledge that was available to me as a doctoral student and while – for a period – I was no longer confined by the finite rules of academic progress (while still operating within their enabling constraints). My main focus was on the role of facilitators using simulation as an educational framework in a tertiary environment. Along the way I explored the tangential question of why some people resist, and object, to anything that involves play in formal learning environments. Fear of making a fool of oneself turned out to be a powerful factor.

## ANACLITIC DEPRESSION BLUES

---

Formal education prizes orderly and sequential progression of knowledge acquisition with visible and sustained reliance on regular written/oral assessment of what has been remembered. It relies on hierarchies of

control based on actual or supposed possession of information to create both a sense of authority in those with knowledge, and a consequent sense of dependency in those seeking to acquire it. Unsettling this set of arrangements can disturb taken-for-granted norms and habits. For some individuals it creates what Jerry Harvey (1999) called the 'anaclitic depression blues' whose symptoms in adults can include depression arising from separation from ideas or relationships that are very important to them. In the context of using simulations and games for learning such *blues* can arise for learners by disturbing the belief that there will always be someone on whom to depend, and therefore they do not have to take responsibility for their own learning.

Conversely it can arise in those higher up the knowledge hierarchy if/when it disturbs their belief that they are the 'knowers' and that their role is to pass on that knowing to those below them, who don't yet 'know'. At some point during preparation for the doctoral work I was advised by an experienced educator that *If the student hasn't learned, then the teacher hasn't taught*. I was horrified by the thought of placing so much pressure on one end of the balance board that is a learning relationship. But this is what formal hierarchies of education seem to imply – and when simulation and games disturb this fragile house of cards, then for some it is too much, and retribution for causing such dislocation can be swift as I learned but did not yield to.

## WHO'S ON FIRST?

---

I am referring here to the famous eight-minute comedy skit by Abbott and Costello where a simple communication task becomes the base for a running joke that has lasted more than 70 years. Visit <https://www.youtube.com/watch?v=kTcRRaXV-fg> to enjoy the comedy for yourself as you think about this – Being 'in control' of a group of game players is as easy as explaining *Who is on first?* And I trust that it becomes clear that *losing control of participants* creates the energy for comedy and learning – but also has consequences.

When Bud Abbott launches into the routine, he and Lou Costello both know they are totally reliant on each other to keep it going and they did

so, flawlessly for years. Designers of simulations and games, educators choosing to use their products, learners entering (willingly or otherwise) into the play 'routine' and administrators overseeing the context are all similarly interdependent in keeping the action going. At any moment even a single player can disrupt the flow and suddenly the educator, the player even the administrator may find themselves in that terror-inducing place of *losing control*. R D Laing showed us these terrors and their framing systems via poetry in his four-line epithet which captures the dilemma of seeing the 'game' but being unable to articulate it in a way that releases all involved from the need for pretence.

*They are playing a game. They are playing at not  
playing a game. If I show them I see they are, I  
shall break the rules and they will punish me.  
I must play their game, of not seeing I see the game.*

As an educator using simulations and games, of course you are *playing a game* and inviting participants to (for example) explore bottlenecks in supply chain management via a one-hour version of the Beer Game (SkillDynamics, 2021) or learn about empathy and environmental awareness via Sky: Children of the Light (thatgamecompany, 2019) a free activity available from Games for Change. You and the participants both know you are all playing a game and that success requires a period of willing suspension of disbelief (Coleridge, 1817). But you also know the boundaries of the game and therefore how to step into – and out of the game. Laing could be interpreted as writing about what happens when those boundaries are violated either by misuse of a game or some unintentional intrusion into personal spaces. Maintaining control in such conditions is not what conventional educators have been trained for – so it is little wonder that resistance to using simulations and games can be found to reside in (often unvoiced) concerns about how to maintain control. I have had this resistance paraphrased as *my students can't ....* – whatever is being proposed, yet the learners have neither been asked to attempt, nor tried and failed, to do whatever is being proposed.

Thus, the question about *Who's on first?* or *who's in control?* is neatly avoided and the fear of losing control remains largely hidden from view –

and so also does the opportunity to invite learners to take up the challenge of getting out of control and into action.

## LEARNING FROM DIFFICULT PEOPLE

---

Difficult people are everywhere – indeed I am one at this moment, overdue as I am with this article. Here – as in other aspects of life the choice for gamers, simulationists and experience-based educators is whether to avoid noticing the *game of avoiding difficulty* or to decide whether to speak up and name it. A short internet search for comments about difficult people revealed three other possible responses – loosely aggregated as *walk away* or *forgive* or *learn with/from* them. The trouble with difficult people is that they seldom recognise the title as pertaining to themselves. They have valid reasons for their stance and are quite prepared to fight for it – even if/when no battle is needed. Educators, uneasy about doing anything out of the normal that might *stir up trouble*, resist using simulations and games because – intuitively or from previous experience – they are alert to their own inner uncertainties and have no wish to put their (actual or self-perceived) frailties on display. Thus, the idea of learning from difficult people will not appeal to them. And, by association, active learning processes which might uncover difficult people will be equally unappealing.

Conversely, educators who do choose simulation and games as learning vehicles are aware they may be in a for a wild ride and prepare accordingly, often in the spirit of Lailah Gifty Akita's advice that – *The difficulties in life are vital for our personal growth and well-being*. This does not mean they succeed on every occasion, rather they know how to succeed and how to fail and moreover that both are equally good educators.

## THAT FLAKY EDUCATOR

---

Fear of acquiring a label like *flaky* can stop otherwise competent educators in their tracks. It seems such an innocuous word to have such a large impact on otherwise competent and experienced educators. So where is its power? And why does it contribute to resistance to use of simulations and games? To answer this question means returning to that earlier comment about organisational hierarchies of control. You are *not flaky* if you have

behaved properly and climbed that hierarchical ladder cautiously and stayed true to orderliness and formal structure. You may be/become *flaky* if you step aside from the ladder and pursue learning that does not appear to contribute to familiar education structures. In his 1930's classic satire on the limitations of formal education titled *The Saber-Tooth Curriculum*, Peddiwell (1939) showed how this can play out by imagining a conversation occurring at a time when the once relevant 'sabre-tooth tiger hunting' curriculum became redundant. The tigers were extinct, and people were facing new threats and needs. One particularly radical agent for change demanded –

*And why in hell should children try to scare tigers with fire when the tigers are dead and gone?*

Only to receive the witheringly logical reply that

*If you had any education yourself ... you would know that the essence of true education is timelessness. It .. endures through changing conditions like a solid rock standing squarely and firmly in the middle of a raging torrent. You must know that there are some eternal verities, and the saber-tooth curriculum is one of them!*

Read the book yourself and consider where you sit along the continuum of *eternal verities*. Are you *flaky*? By which I mean prepared to change when that is required to stay aligned with what is happening around us, or stuck like *a solid rock* hoping that change does not touch you?

Being *flaky* may well mean taking risks, some of which will fail. It may mean encouraging learners to allow meaning to emerge from action – and inaction. It will mean failure at times. It also suggests enjoyment (who does not enjoy a deliciously buttery flaky pastry!) and a lightness of touch. *Flaky* does not mean delicate or insubstantial – although both those charges may be hurled at educators who make the choice to step aside from convention and orderliness.

## REPRIMANDS, PUNISHMENT AND PENANCE

---

Being reprimanded by colleagues or managers is never pleasant, and seldom actively sought after. And in my opinion, is often used as a way

of diverting attention from the problems that simulations and games may have caused to emerge in the broader context. But this is seldom evident in the moment of the reprimand. Again, to draw on my own experience, as I was beginning my doctoral studies I was subjected to a severe reprimand and ordered not use simulation in my practice after a (yes one!) student complained about its adverse impact on her. It took a doctoral research program to identify that as the underlying issue! Her letter of complaint was laden with accusations about my bad practice, the terrible textbook and sundry other grievances.

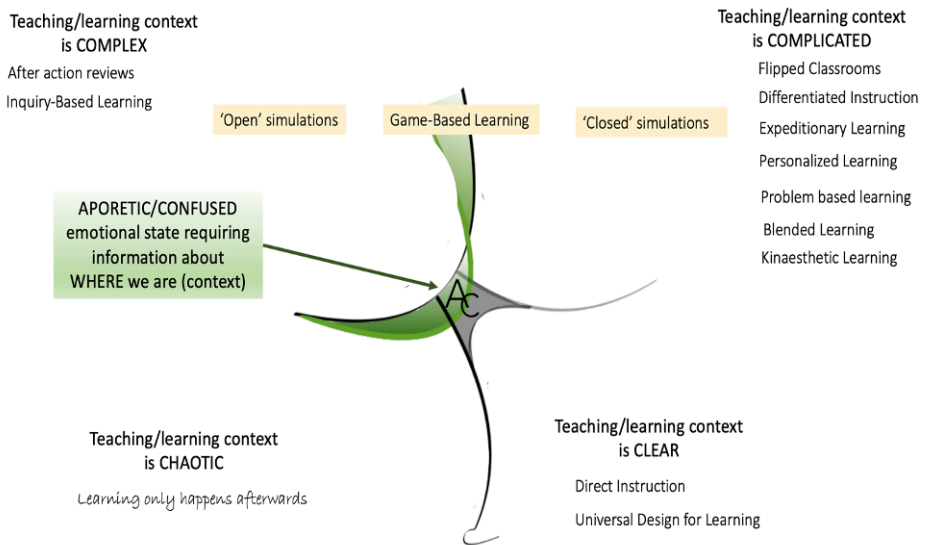
I took my punishment and then worked frantically to review what had happened and why. Along the way my *punishment* turned into the reward of extensive international travel in pursuit of answers, new friendships and publication of books and articles. If she had not complained so bitterly, and the manager had not blundered so badly, much of that might never have happened. I am not saying do not be afraid of punishment, I am saying it may open up opportunities not previously considered or possible. And as times passes, I sense that the irony is that it is the *fear* of a reprimand that holds individuals back from using simulations and games, and not the reprimand itself.

## COMPLICATED, COMPLEX AND CHAOS

---

One knowledge management tool which can be usefully applied to explaining how to locate simulations in differing contexts is the Cynefin domains of knowledge (Snowden & Boone, 2007) which defines five kinds of contexts. Using this tool different forms of play and games allows effective positioning of different forms of activity making them more likely to be acceptable. The Cynefin framework identifies *Ordered*, *Unordered* and *Confused* as three conditions of human operations. *Ordered* conditions are easily recognisable and quickly responded to, based on routine applications of familiar habits. *Unordered* conditions are unfamiliar, so exploration is essential and may require reflection observation to precede examination. When conditions are *Confused* an essential first step is to determine the domain you are in and then move towards operating according to the relevant heuristic thus: In *Ordered* conditions the *Clear* domain employs the heuristic of *make sense of conditions to understand*

(categorise) them and respond, (think of a classroom and the engrained habits of behaviour to be seen there). Still in an *Ordered* condition the *Complicated* domain requires *making sense of conditions, then analysing them to establish how to response*. The domains in *Unordered* conditions require a different approach. The *Complex* domain must be examined (probed) in order to make sense of events before responding, while the *Chaotic* domain demands action with some possibility of making sense later.



© E Leigh and LL Levesque, 2021

Image 3: Cynefin Domains of knowledge – a framework for locating simulations and games in context

This is a helpful set of rubrics once we understand that the unsettling feelings created by simulations and games push participants, educators and administrators into conditions of *Confusion* where, without quick and effective use of an appropriate rubric, *bewilderment* takes over and everything must revert to *Order* as fast as possible in order to avoid immersion in the *anaclitic depression blues*.

Making visible the alliance of simulations and games with relevant learning goals as anchored within the Cynefin context-based framework enables proponents to be specific when describing why games and simulations



are valid and viable learning strategies. *Open* simulations and games are characteristically found in the Complex knowledge domain, and are more likely to induce fear and confusion than *Closed* designs which reside in Ordered conditions. The latter are puzzles to be solved, with the security of knowing that someone else has previously done so.

A range of literature, aligning education contexts with forms of simulation and application principles allowing the user to gauge their relevance and efficacy for particular learning environments is available at <http://www.btwebz.com.au/simulation/framework.htm>. While this was created for a healthcare learning environment its principles are applicable in most learning contexts, and well worth exploring.

## REVIEWING THE STATE OF PLAY

---

A review of what is known about playing to learn reveals clashing beliefs and cultural values, misunderstandings, and fear, turning education into battle grounds where quality, logic and reasoning are insufficient to change attitudes. Undertaking a project management-style *After Action Review* of successful projects and ones that have stalled or failed, would provide an interesting list of propositions for enlightening educators and administrators disinclined to consider play as a legitimate learning mode. One spectacular example of well-formed education materials that included simulations and games as part of its overall strategy was the carefully crafted and extensively supported M.A.C.O.S. curriculum which included several board and card games to introduce cultural diversity themes. The defeat of this ambitious project based partly on ill-judged and ill-informed arguments (Gudzial, 2018) remains a salutary reminder that education can become a battle ground on which factors like quality of work, logic and reasoning are not the best or sufficient weapons of defence.

## WHAT'S TO DO?

---

So, what can proponents of simulations and games do to help educators make the 'seismic' shift from resistance to adoption of games for learning? I propose three stratagems. First face up to our foibles and prejudices – we love to play, believe it has no equal when the task is to provide engaging

and memorable learning moments. But – those are beliefs not facts equally relevant to all contexts or settings or goals. So, knowing how our own stance affects our actions is a primary task.

Second understand that educators who do not share our beliefs or passions may be –

- daunted by the amount of change to routines required
- troubled by the ‘extra time’ that games seem to require
- thinking of games as a whole new language – and wondering how they could find time to learn it?
- concerned for their reputation/status
- inclined to think that *It's not education if it's play*
- focused in providing abstracted formal education
- unable to see games as ‘purposeful education’
- worried that games can be considered a cop out – *avoiding the hard work of learning*

– and accept all of these as valid, honourable and reasonable beliefs (just as ours are). To address them we need a variety of approaches too many to be addressed here – but there is a great deal of literature available – and of course Games for Change is a great place to begin your explorations. Where we too often fail, is in not accepting the validity of these beliefs and then pushing ahead with our agenda at the expense of achieving shared understanding. I offer the glorious failure of M.A.C.O.S. as evidence for this.

And finally look closely at all our designs, toys, playthings, programs, apps, participants, learning goals and contextual characteristics and spend the requisite amount of the time to learn how to blend them for the benefit of all involved. Hasten slowly is a useful motto when we aim to influence towards change. Sometimes games and simulations will win, sometimes they will lose – but there will always be learning. Although M.A.C.O.S. has disappeared Jerome Bruner, its educational *godfather* continued to learn and write and contribute concepts and ideas that still influence learning, albeit perhaps not in the ways he'd once thought.

REFERENCES

---

- Abbott, B. & Costello, L. (1951). Who's on First? <https://www.youtube.com/watch?v=kTcRRaXV-fg>
- Akita, L. G. (2021). *The difficulties in life are vital for our personal growth and well-being*. <https://www.goodreads.com/quotes/tag/difficult-people>
- Carse, J. (2013). *Finite and Infinite Games*. The Free Press.
- Coleridge, S. T. (1817). *Suspension of Disbelief*. Available at Wikipedia – [https://en.wikipedia.org/wiki/Suspension\\_of\\_disbelief](https://en.wikipedia.org/wiki/Suspension_of_disbelief)
- Guzdial, M. (2018). *Computing Education Research Blog*. <https://tinyurl.com/8vm6znak>
- Harvey, J. B. (1999). *How come every time li get stabbed in the back my fingerprints are on the knife?* Jossey-Bass.
- Holt, J. (1972). *How Children Learn*. Penguin.
- Leigh, E. (2003). *A Practitioner Researcher Perspective on Facilitating an Open, Infinite, Chaordic Simulation*. (EdD) UTS, Sydney. at <https://opus.lib.uts.edu.au/handle/2100/308>
- OUP (1996). *Oxford Dictionary of Quotations*. Revised edition editor Angela Partington OUP
- Peddiwell, J. A. (1939). *The Saber-Tooth Curriculum: Adapted from: Benjamin, H.R.W., Saber-tooth Curriculum*. McGraw-Hill.
- Snowden, D. J., & Boone, M. E. (2007). A Leader's Framework for Decision Making. *Harvard Business Review*. November 2007, 69-76. <https://hbr.org/2007/11/a-leaders-framework-for-decision-making>.
- Shepherd, I. (2017). *A Conceptual Framework for Simulation in Healthcare Education*. Victoria University. [http://vuir.vu.edu.au/35047/1/SHEPHERD%20Irwyn-Thesis\\_nosignatures.pdf](http://vuir.vu.edu.au/35047/1/SHEPHERD%20Irwyn-Thesis_nosignatures.pdf)
- Sivasailam Thiagi Thiagarajan, P. D., Richter, M. S., & Thiagarajan, R.

(2021). *Facilitator's Toolkit*. <http://www.thiagi.com>, Workshops by Thiagi, Inc.

SkillDynamics. (2021). *Beat the Bullwhip Effect with our supply chain simulation*. <https://skilldynamics.com/supply-chain-beer-game/>

thatgamecompany. (2019). *Sky: Children of the Light*. <https://www.gamesforchange.org/game/sky-children-of-the-light/>

Wilson, L. O. (2020). *Types of Curricula*. <https://thesecondprinciple.com/instructional-design/types-of-curriculum/>



# *Practicing to become a teacher: learning from simulations and roleplays*

ANNE SOUTHALL, STEFAN SCHUTT, REBECCA MILES-KEOGH, ADAM STAPLES & STEVE MURPHY

## ABSTRACT

---

This paper explores how teachers-in-training can gain crucial experience by taking part in simulations and roleplays. The use of simulations and role plays has been in discussion by teacher trainers for some years, inspired by practices in other highly regulated industries such as health care and nursing, but the same rate of adoption has not been forthcoming. However, this need has become more evident – even urgent – during the COVID-19 pandemic and subsequent school closures, which has result in cancelled placement opportunities on a massive scale.

We argue that although actual classroom experience remains a central component of teacher training, critical skills developed through practice experience can be provided in virtual environments that deconstruct the complex practice of teaching and explicitly make connections to the theories and principles of good teaching. We identify key features to be considered when creating effective simulated teaching and learning experiences. A range of technologies are discussed that support approximations of practice, and we present an experimental example of

a simple interactive video that was created using readily available technologies.

## INTRODUCTION

---

Teacher education, like most other elements of society, has had a difficult 2020 and 2021. The COVID-19 pandemic forced an unexpected and rapid adaptation to online working, teaching and learning – and this has continued as the virus has continued to impact daily life around the globe. This is particularly true in teacher education where disrupted school placements and distance learning have resulted in a varied (and often diminished) experience with teaching students leaving their studies less prepared than pre-COVID graduates. A large body of literature has established the value and impact of simulations in teaching different forms of practice, including via digital platforms. In response, we discuss some promising pedagogies designed to deconstruct the complex and dynamic nature of classroom practice, as well as aligned technologies that offer simulated learning experiences including role plays and serious games. This paper will focus on current literature surrounding these efforts to ‘approximate practice’ (Grossman et al., 2009) and identify some key features. We argue the need for explicit representations of practice that can be decomposed and analysed, followed by opportunities for practice approximations and feedback through simulation, role play and serious games.

## SOCIAL PRACTICE THEORIES

---

In teacher education, a disconnection exists between what might be deemed ‘the practice of teaching’ and ‘the teaching of practice’. The research tells us that beginning teachers often find it difficult to apply what they learn in their course to their work as teachers. Commonly dubbed ‘practice shock’, beginning teachers will typically regress from the research-informed things they have learnt in their course to personal understandings developed through their own school experiences (Blomber et al., 2013; Lampert & Ball, 1998). Teacher education, researchers say, needs to be more effective in helping students develop practical knowledge

and skills for the classroom (Cochran-Smith et al., 2017). It needs to shift from a focus on what teachers *know* to what they *do* (Kemmis et al., 2014). This focus on *practicing* presents a particular challenge to teacher education where practical (school-based) and theoretical (university-based) elements are often distinctly different. This means that the complex practices of teaching remain opaque for many teaching students (Miles et al., 2016).

This is where practice theory, which recognises the complexity of teaching as a practice, can shed light. Centred on Grossman's theory of professional practice pedagogy, a practice theoretical approach allows for an emphasis on 'core' teaching practices. Described by Grossman et al. (2009) as "occurring with high frequency in teaching" (p. 277), 'core' or 'high leverage' (Ball & Forzani, 2009) practices like these can be approximated in a range of ways.

Social practice theories provide a way to understand practice in three ways that are helpful for articulating the development of professional (and thus teacher) practice:

- as *practising* – the repeated action and activity, habituation;
- as an organised nexus of actions that hang together, teleologically, through **do-ings** – the bodily actions and activities; **say-ings** – the speech acts; and **relatings** – the relating actions between people and between people and the world (Kemmis et al., 2014), and;
- as the actions that are *performed* in a practice of something (i.e. the practice of teaching, of nursing and so on)

Kemmis and colleagues' work in Practice Architectures focuses on the second of these, providing the following definition of practice:

A practice is a socially established cooperative human activity in which characteristic arrangements of actions and activities (doings) are comprehensible in terms of arrangements of relevant ideas in characteristic discourses (sayings), and when the people and objects involved are distributed in characteristic arrangements of relationships (relatings), and



when this complex of sayings, doings and relatings 'hangs together' in a distinctive social project. (Kemmis et al., 2014, p. 31)

In drawing these notions of practice together, a professional practice is a collection of activities that involve the performance and repetition of *doing* things, *saying* things and *relating* things that hang together as a distinct practice. Practices however are also nebulous, always incomplete and ever-changing in-the-moment being formed, re-formed and transformed through the (re)interpretations of the carriers of a practice (Reckwitz, 2001). Further, while a 'practice' is performed through individual actions, practices are collectively and historically constituted. This provides a philosophical grounding for looking at practices as the bodily movement, behaviours, and speech acts, actualised through the nexus of sayings and doings that are performed as actions in the world. These sayings and doings underlie the construction of habits, pre-dispositions, life conditions and subjectivities (Schatzki, 1996).

## TEACHING AS UNNATURAL PRACTICE

---

The practices of teaching are different to the everyday 'teaching' that we naturally undertake in explaining, questioning, and sharing with colleagues, friends or family. Such teaching practices can be summarised as *unnatural* practice. They include the minutiae of specific knowledges and activities that teachers are required to know and do in facilitating student learning (Ball, 2009). If these unnatural practices are not explicitly taught, then novice teachers' theoretical knowledge remains inert where it "can be retrieved when required, but it does not guide their classroom practice" (Blomberg et al., 2013, p. 91). When pre-service teachers are learning the embodied and emplaced practice of teaching through *practising*, they become actors in the practice of teaching. School placements are seen as opportunities for students to *enact* their theoretical and practical knowledge but vary considerably in the quality of experience. This is not unique to teacher education. Wyllie et al.'s (2020) research on the experiences of nursing students provides a similar critique. The nursing students they worked with suggest that to be well supported by their lecturers, theory should be bolstered by simulation in a safe environment that provides "students the chance to assess, analyse, consider, react and

reflect on their own experiences in a safe environment ... [and] allows students to repeat, evaluate and reflect on their learning, based on feedback" (p. 22).

## SIMULATED LEARNING

---

Pedagogies of enactment according to Grossman et al. (2009) define the use of interactive materials created to support practice-based teacher education as the "decomposition" of the practice of teaching into components that can be separately role played, reflected upon and refined. Given that "much of what teachers need to know to be successful is invisible to lay observers" (Darling-Hammond, 2006, p. 300), this would involve explicitly identifying and targeting such elements of the profession for "the enactment of knowledge, beliefs, and dispositions through strategies, routines, and moves that can be unpacked and learned by teachers" (Grossman & Dean, 2019, p. 158).

Although the literature includes all aspects of teaching as benefitting from simulated learning experiences, Edwards-Groves (2018) identifies the enactment of core dialogic practices such as communicating, listening and interacting with students in classrooms as essential. These aspects of teaching, they claim, are critical in the development of what Forzani (2014) describe as "core practices" in teacher education: "Because 'teaching' is now more widely understood as interactional, improvisational work in which students' ideas and beliefs are critical resources, the practices that are viewed as important for novices to master include eliciting and interpreting student thinking, leading class discussions, and facilitating small group work, to name some examples" (Forzani, 2014, p. 365). Kaufman and Ireland (2016, p. 261) warn however that "adopting simulations for teacher education is challenging". Effective simulations, they claim, are not only based in a strong theoretical foundation, but also on a clear understanding of the behaviours to be practiced or assessed, a valid simulation model, enough realism to engage users and mechanisms for evaluation, feedback and debriefing (Kaufman & Ireland, 2016, p. 267).

This notion of evaluation, feedback and debriefing is further emphasised in reflective practice research where researchers observe that when teacher

candidates are provided opportunities to reflect upon and discuss classroom practices, their understanding of the teaching process deepens (Brookfield, 1995; Hughes & Mapes, 2012; Lee & Young, 2010; Matthew et al., 2009). When processed with student teachers in a manner similar to what Baird et al. (1999) describe as 'structured reflections', and simulation researchers label the 'after-action-review process' (Straub et al., 2014), simulated experiences can generate deeper levels of understanding about "specific aspects of instruction, such as questioning, responding, and use of wait-time, or commentary regarding more qualitative aspects of teaching" (Berg & Dieker, 2017, p. 2059). When simulated learning experiences include the opportunity for both individual decision-making and shared analysis and reflection, it is thought that pre-service teachers can move from theory into action, more effectively (Dotger, 2015).

While teacher preparation and practice experiences necessarily occur in real classrooms, advocates of simulated experiences claim the simulated experience can afford student teachers the opportunity to experience varying degrees of complexity, unlike actual classrooms where so many uncontrolled factors can potentially overwhelm them. Since pre-service teachers are yet to develop the rudimentary skills of teaching, by reducing the distractions they are able to focus on specific aspects and processes (Berg et al., 2017). Simulated learning experiences can leverage this sense of 'tunnel vision' by foregrounding a sub-set of skills, while more difficult challenges are dampened or removed (Berg et al., 2017); an advantage identified by Grossman (2011) as a precursor to engaging in more complex practice. Since "one of the well-documented problems of learning from experience is knowing what to look for, or how to interpret what is observed" (Grossman et al., 2009, p. 2069), simulated learning experiences can direct the focus in order to more deeply analyse and understand each of the constituent parts. Simulated 'approximations' also provide the opportunity for specific and targeted feedback (Grossman, 2011) followed by the opportunity to replay the simulation. Here digital technologies are more widely used as they offer the opportunity to replay the experience many times (Kauffman & Ireland, 2016). Naming component parts of teaching practice (Hauser & Kavanagh, 2019) and offering the opportunity to practice them in a low risk environment, provides for what Schön's earlier (1983) work on teacher education identified as essential to novice

learning. Low risk environments can encourage critical skills development, allowing students “to encounter problem situations, try decisions and actions, experience the results and modify their behaviour without risking harm to themselves or others (Kaufman & Ireland, 2016, p. 261). Carrington et al. (2011) point out this low-risk environment is particularly relevant when working with vulnerable students.

Another element, described by many authors as critical in simulated learning, is the authenticity of the learning context (Bridges et al., 2016). Kaufman and Ireland (2016, p. 267) describe effective simulations as having “enough realism to engage learners”. The closer the context and responses to those interactions, the more effective the learning experience is thought to be. Not all researchers agree however. Hopwood (2017) for example asserts the very nature and asset of the simulation is unreal and “by embracing the unreal, and the fluid play between real and imaginary...a pedagogically rich moment can unfold and be exploited for all its unreal, fake, and fictional qualities” (p. 78). In this way authenticity is an outcome of the generative dialogue between the concepts and concrete actions the simulation elicits and inspires. The real value of pedagogies of enactment is realised when “theory bolstered by simulation provides students the chance to assess, analyse, consider, react and reflect on their own experiences in a safe environment ... [and] allows students to repeat, evaluate and reflect on their learning, based on feedback” (Wyllie et al., 2020, p. 22).

## TECHNOLOGY AND THE SIMULATED LEARNING EXPERIENCE

---

Although teacher education has not adopted technology-mediated role plays and simulations with the same gusto as disciplines like health care, it is catching up “as technology-supported teaching simulations become more sophisticated, more easily implemented, and more widely used” (Kaufman & Ireland, 2016, p. 265). In doing so, teacher education can draw on fields that have long looked to media technologies to create simulated learning experiences in line with education technology pioneer Seymour Papert’s (1980) concept of Microworlds: “a subset of reality or a constructed reality whose structure matches that of a given cognitive mechanism so

as to provide an environment where the latter can operate effectively” (p. 204).

Early approaches involved the use of analogue video and audio recording and playback, which continued until the early 2000s (Wearne, 2004). At the same time, computer simulations began to be used for student simulations from the 1980s (Ives, 1990), with professions such as health care, engineering, law and information technology recognising their potential to help students develop their interpersonal and situational skills. Skills like these have commonly been called ‘soft skills’ (Hegland, 1981; Kroning, 2015; Maier, 2007), which can refer to everything from social skills to ‘self-efficacy, stresscoping, and motivation’ (Maschuw et al., 2011, p. 480). And increasingly, educators have turned to computer-based platforms to teach them. A 2014 definition of ‘Immersive Education’ (The Immersive Education Laboratory, cited in Gardner & Elliott, 2014) is resonant with Seymour Papert’s ideas: of giving “participants a sense of ‘being there’ even when attending a class or training session in person isn’t possible, practical, or desirable, which in turn provides educators and students with the ability to connect and communicate in a way that greatly enhances the learning experience” (p. 2). In health care education in particular, the increasing sophistication and affordability of virtual environments has led to an upsurge of interest in their use (Saxena et al., 2016; Falah et al., 2014; Maschuw et al., 2011; Abshier, 2012).

The emergence of the World Wide Web in the early 1990s further boosted this trend. It eventually led to online role plays (Maier, 2007), as well as editable multi-user virtual worlds such as Second Life. Online platforms also offered new potential for the creation of branching ‘decision trees’ that allowed students to learn about complex scenarios requiring nuanced contextual awareness instead of a single ‘correct’ response. In the 2010s, the increasing profile of Serious Games (or games with an educational, health or social purpose) saw the development of initiatives such as the European Union-funded Serious Game Mechanics Framework project to better understand the pedagogical affordances of game-based learning (Arnab et al., 2015).

## VIRTUAL TEACHER PRACTICES

---

As soon as accessible online platforms like Second Life began to emerge in the 2000s, teacher educators began to explore their potential. The term 'virtual worlds', otherwise known as Multi-user Virtual Environments (MUVes), was used to describe a diverse number of these platforms, whose core affordance of "scenarios, simulations and role-plays" (Savin-Baden et al., 2010, p. 131) proved promising for teacher educators. In 2009 the Australia and New Zealand Virtual Worlds Working Group (VWWG) was founded and saw over 200 tertiary educators sharing their practices and publishing through a series of conference papers from 2011 to 2016 in the proceedings of the e-learning conference Ascilite. This annual series of conference papers both highlighted innovative virtual practices in teacher education and other areas, and outlined the technical, resourcing and bureaucratic obstacles involved in their implementation (Gregory et al., 2015). Projects highlighted included a virtual environment "designed to provide pre-service teachers with opportunities to undertake situated role play that enabled them to gain classroom management skills, lesson design and implementation experience." (Gregory et al., 2016, p. 246), and the Simon-a-Stick (SoaS) platform that allowed students to create environments and avatars in "a safe, closed environment where work can be transferred to an online space so that the pre-service teacher can visit and explore the spaces" (Gregory et al., 2016, p. 249).

Researchers have pointed to the suitability of digital simulations for student teachers due to their "low-stakes environment", with participants able to "experiment without the risk of consequences they might normally face if their classroom decision takes an ineffectual or even chaotic turn viewed by a university supervisor or cooperating teacher" (Manberg et al., 2007, p. 132). Simulations allow "preservice teachers to practice and reflect in a relatively consequence-free environment before assuming responsibilities in a live classroom" (Manberg et al., 2007, p. 149). In Manberg et al's study, this was seen to lead to positive attributions including "self-efficacy, emerging professional identity, empathy, leadership, knowledge base, collaboration, ethics, and critical thinking" (p. 128).

Recent years have seen an increasing sophistication of online, subscription-based tools such as Labster in STEM education (<https://www.labster.com/>), with the COVID-19 pandemic proving additional impetus for their adoption (Wlodkowic, 2021; Harland, 2021). These platforms have made it possible for educators to create sophisticated and scalable simulated experiences without the need to invest in the development and maintenance of custom software.

## ROLE PLAYS

---

Role plays have been a feature of many simulated student experiences, as seen in the VWWG's reporting of projects. Participants took part in role plays by operating avatars or virtual characters. They were used to "demonstrate a point or concept and many were unscripted providing a transformative learning experience. Students had to participate in the role-play requiring them to reframe the knowledge gained from their training." (Gregory et al., 2016, p. 248). Indeed, role plays (albeit non-virtual ones) have long been recognised as effective by educators in a number of disciplines (Hegland, 1981; Wearne, 2004), and have involved either role playing with peers or hiring trained actors. This is known in medical and healthcare parlance as 'standardised patients' (Bosse et al., 2015). Hiring actors, however, is expensive (Bosse et al., 2015). Even peer-based face to face role plays, though framed as more cost-effective than those using actors (Bosse et al., 2015), tend to generate large resourcing overheads due to the need to coordinate activities during an era of increasing student to staff ratios (Maier, 2007; Bosse et al., 2015).

Financial and resourcing factors have long played a role in both inhibiting and promoting the use of digital simulation platforms in education – but this aspect is sometimes overlooked in research. The need to maintain and troubleshoot custom software, installation, hosting and IT support difficulties, and licensing costs have all played their part in discouraging educators from relying on such platforms in the longer term (Gregory et al., 2015; Schutt & Linegar, 2013). However, in recent years the scalability and increased sophistication of some digital platforms and the growth of supported, relatively low-cost subscription-based online platforms (such as SimSchool) have countered this trend. Some areas of tertiary education

have invested heavily in their own platforms, realising the scalability potential of taking students through otherwise expensive technical processes in highly specialised facilities. One example is the Pharmatopia platform, a collaborative international project involving multiple universities and pharmaceutical industry partners, which created a simulated pharmaceutical pill-making learning environment used by students globally.

## SERIOUS GAMES

---

In recent years, dedicated simulation platforms for teacher education have begun to appear on the education market as well as platforms developed for in-house use by university faculties of education such as ClassSim (Ferry et al., 2010), Cook School District (Girod & Girod, 2006) and Teach ME (Bautista & Boone, 2017). Kaufmann and Ireland (2016) describe three overlapping types of situational simulations: scenario/role play simulations; simulations with standardised students; and computer-based simulations. A number of mixed-reality, game-like products can be seen as all three, with participant student teachers interacting with virtual student avatars in what Sweeney et al. (2018, p. 670) call “virtual field experiences” within a classroom. The aim of such products is for future teachers to practice their teaching skills without putting classroom students, themselves or their institutions at risk (Hughes et al., 2005).

One of the best known is SimSchool which is powered by an “artificial intelligence model {that} uses a hill-climbing algorithm to mimic how learners adjust and adapt themselves to meet the physical, emotional, and cognitive requirements of a task. The adjustment process takes place in a multidimensional space for each virtual student and evolves during each class session depending on what you, the player, do as a teacher” (Bush & Hall, 2013, p. 2550). SimSchool is described as inexpensive, scalable and a safe way for students to practice and learn in a range of situations (Kruse & Gibson, 2011), but has generated mixed reports about its effectiveness (Badiee & Kaufman, 2015). Bush and Hall (2013, p. 2550) make the point that SimSchool (and digital simulations in general) are not able “to completely replicate the target environment”, with oversimplification “losing a key factor of a complex situation”. A counter-argument, however,



is that simulations do not intend to replicate this complexity, but rather key elements of it, or as approximations or “metaphors” (Wilson, 1995, p. 25) that create a space for learning through trial and error and/or conceptual consolidation of theoretical material.

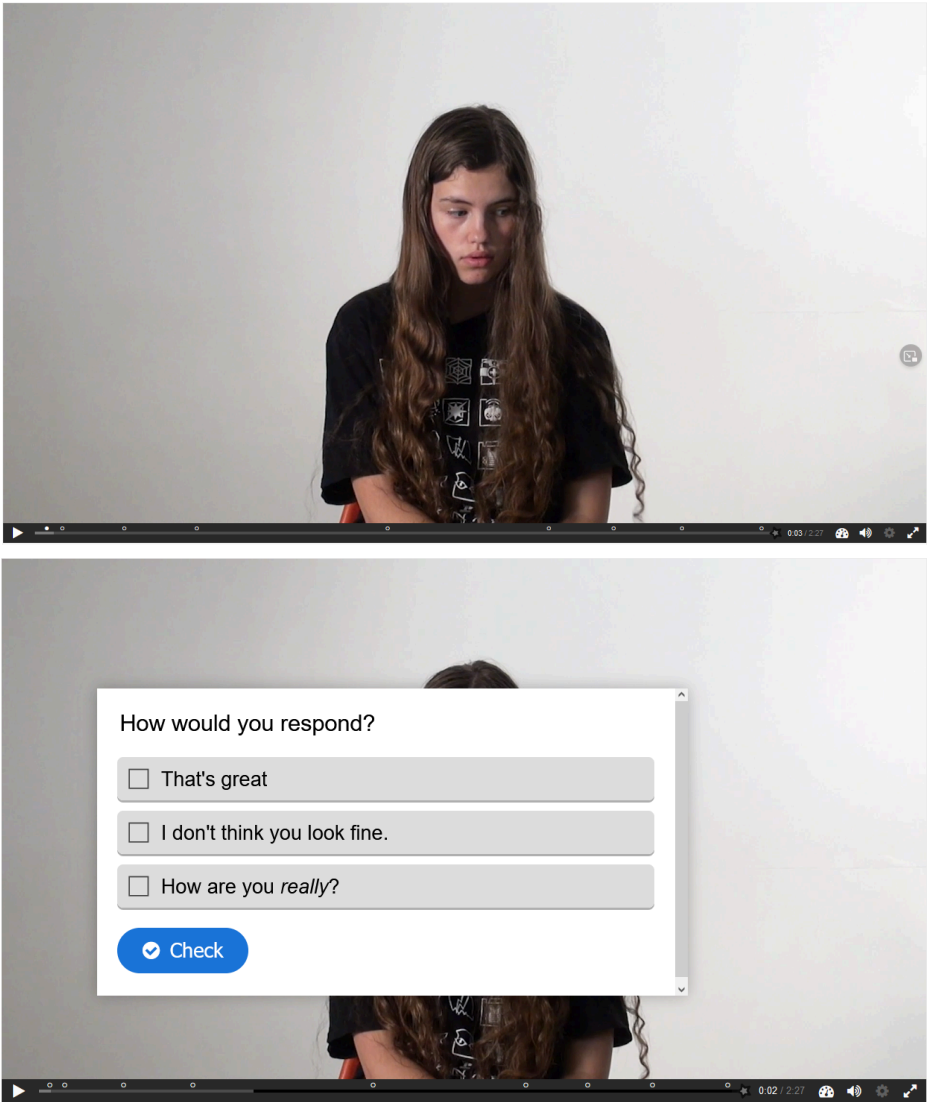
Another mixed-reality platform along similar lines to SimSchool is TeachLivE, developed by the University of Central Florida. Again, its premise is a participant teacher in charge of a classroom of avatars who “can display inappropriate behaviors, such as an attention-seeking student who is quite happy to respond repeatedly to more difficult challenges such as aggressive power and revenge-type behaviors, and passive fear of failure behaviors” (Berg & Dieker, 2017, p. 2060). Behaviour/challenge levels can be adjusted in advance by teacher educators. As a contrast, a different, and less technically complex, platform is LessonSketch, a simple and free online tool developed by the University of Michigan School of Education that allows teacher educators to create cartoon strip-like ‘sketches’ of classroom scenarios to use with student teachers as a conduit for discussion and reflection on teacher practice. Designed specifically for mathematics teachings, LessonSketch shows that simulation doesn’t always need to be ‘high-tech’ or elaborate to be an effective tool for educators. Chazan et al. (2018, p. 201) describe the role of LessonSketch in devising experiences for student mathematics teachers and deploy “Grossman’s pedagogies of practice to explore how with the materials they are creating teacher educators are representing practice, decomposing it, and providing opportunities for their students to approximate practice through the curricular artifacts that they are creating”. However, LessonSketch provided an unintentional lesson in late 2020 when it was discontinued, due to being built on the now-unsupported Adobe Flash platform. Its users learned that proprietary digital platforms can change or be discontinued without warning, and so cannot always be relied upon in the longer term.

## BRINGING IT ALL TOGETHER: A SIMULATION EXPERIMENT

---

Applying the principles of practice theory as a nexus of actions, and acknowledging the unnatural practice of teaching, we now present an experimental virtual simulation project. As a response to the deterioration

in mental health and wellbeing of Australian students, as exacerbated by the COVID-19 era lockdowns (Ivbijaro et al., 2020), mental health organisations are increasingly charging teachers with addressing the rising suicide rate amongst our youth (Atkins et al., 2010). One of the recommended approaches in suicide prevention is for trusted teachers who have developed a positive relationship with a student to openly talk to a student about their thoughts and feelings (Rishel, 2006). There is a natural fear and reticence in teachers to have these conversations as they feel underprepared, lack confidence in their ability to 'say the right thing' and fear a sense of responsibility should a suicide attempt be made after the conversation. Research however continues to emphasise the benefits of a conversation about suicidal thoughts as prevention, and reports that students tend to interpret the lack of willingness to talk about their obvious distress as a lack of care in the adults around them (Rishel, 2006). A simulated interactive video experience was therefore developed to rehearse a conversation with a young person about their suicidal thoughts in a low risk, low stakes virtual environment. This experience involved students watching an 8-minute video of the young person speaking, interspersed with text-based multiple choice response options at crucial points, with responses dependent on the choices made. The program was set on a loop where students were able to repeat their conversation multiple times to practice the preferred responses after reading their written feedback.



*Image 1.1 and 1.2: Screenshot of 'suicide conversation' pilot simulation*

Several practice concepts were deliberately incorporated into the design informed by the literature. The first was a desire to present a valid simulation model with enough realism to engage users (Kaufman & Ireland, 2016, p. 267). A young actor was employed to play a student who looked directly into the camera with her scripted responses. This provided a

realistic approximation for a one-on-one conversation a teacher might have with a student. The H5P platform was chosen because it was available to the host university staff for no cost, was supported by university IT staff and could be easily embedded within the university's learning management system Moodle. H5P's interactive video tool could be set up to allow for participant decision making and multiple repetitions for practice both considered central to develop the skills involved in this kind of relational interaction (Grossman et al., 2009). Relevant literature was searched for best practice examples of the decomposition of the conversation and the preferred responses (Beyond Blue, n.d) to inform the automatic feedback for self-evaluation. These principles were applied with the aim of encouraging pre-service teachers to move from knowledge about the importance of such a conversation into the action of actually initiating one (Dotger, 2015).

## CONCLUSION

---

In the era of the COVID-19 pandemic, the accelerated use of, and reliance on, technology has necessarily provoked thinking about its possibilities for teacher education. This paper returns to practice theory to identify high leverage practices suitable for embedding in virtual environments. Whereas teaching placements can be variable and contingent, and often overwhelming for the novice, custom simulations can be carefully designed to bridge the theory-practice divide, be based on a sound theoretical foundation, and enable students to hone specific aspects of their practice, deepening their understanding. Simulations that enable the deconstruction, analysis and reflection on the complex work of teachers in a low-risk environment can provide effective alternatives to some face-to-face experiences and designs. The interactive video described was the first, low-key attempt to explore these possibilities. Further experimentation and research will better help educators understand the impact of virtual environments of all kinds and the possibilities they offer for initial teacher education.

As a final thought, it is important to note the practical considerations when developing technology-based simulations and role plays, regardless of the discipline. Developing and maintaining bespoke software is resource-

intensive and requires commitment by the organisation implementing it. Issues include ongoing maintenance, hosting, support and the obsolescence of technology platforms on which such solutions are built (Schutt & Linegar, 2013). As Crawford et al. (2019, p. ix) point out, “the development of impactful simulation experiences requires an operational team with extensive knowledge in simulation hardware, audiovisual systems, information technology integration, moulage, theatrics, adult learning theories, management, and more”. Here, the recent growth of free or cheaper subscription-based online technologies of the type mentioned above offer new possibilities for the relatively inexpensive creation of scalable simulated experiences, including ones that do not need to be technologically complex to be effective.

## REFERENCES

---

- Abshier, P. (2012). Feasibility Pilot Study: Training Soft Skills in Virtual Worlds. *Games for Health* 1(2), 174-176.
- Arnab, S., Lim, T., Carvalho, M.B., Bellotti, F., de Freitas, S., Louchart, S., Suttie, N., Berta, R. & De Gloria, A. (2015). Mapping learning and game mechanics. *British Journal of Educational Technology*, 46, 391-411. <https://doi.org/10.1111/bjet.12113>
- Atkins, M. S., Hoagwood, K. E., Kutash, K. & Seidman, E. (2010). Toward the integration of education and mental health in schools. *Administration and policy in mental health and mental health services research*, 37(1), 40-47. doi:10.1007/s10488-010-0299-7
- Badiee, F. & Kaufman, D. (2015). Design Evaluation of a Simulation for Teacher Education. *Sage Open*, 1-10. doi: 10.1177/2158244015592454
- Baird, L., Holland, P., & Deacon, S. (1999). Learning from action: Imbedding more learning into the performance fast enough to make a difference. *Organizational Dynamics*, 27(4), 19-32. doi:10.1016/S0090-2616(99)90027-X
- Ball, D.L. & Forzani, F. (2009). The work of teaching and the challenge for teacher education. *Journal of Teacher Education*, 60(5), 497-511.

Blomberg, G., Renkl, A., Sherin, M. G., Borko, H., & Seidel, T. (2013). Five research-based heuristics for using video in pre-service teacher education. *Journal for Educational Research Online / Journal für Bildungsforschung Online*. <http://www.j-e-r-o.com/index.php/jero/article/view/340>

Berg, C.A., Dieker, L., Ashman, S. & Scolavino, R. (2017). Three Technological Tools Used to Develop, Improve, and Analyze Teaching. In P. Resta & S. Smith (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference* (pp. 2057-2066). Austin, TX, United States: Association for the Advancement of Computing in Education (AACE). <https://www.learntechlib.org/primary/p/177499/>.

Beyond Blue, (n.d.) *Life changing conversations* .<https://www.beyondblue.org.au/the-facts/suicide-prevention>

Blomberg, G., Renkl, A., Gamoran Sherin, M., Borko, H., & Seidel, T. (2013). Five research-based heuristics for using video in pre-service teacher education. *Journal for educational research online*, 5(1), 90-114.

Bosse, H.M, Nickel, M., Huwendiek, S., Schultz, J.H., & Nikendei, C (2015).Cost-effectiveness of peer role play and standardized patients in undergraduate communication training. *BMC Medical Education*, 15, 183.

Bowman, K., (2010). Background paper for the AQF Council on generic skill. *Australian Qualifications Council*.

Bush, L. & Hall, J. (2013). Rethinking Pre-Service Teacher Training- Lessons Learned with simSchool. In R. McBride & M. Searson (Eds.), *Proceedings of SITE 2013-Society for Information Technology & Teacher Education International Conference* (pp. 2550-2553). Association for the Advancement of Computing in Education (AACE).

Bridges, S., Chan, L. K., & Hmelo-Silver, C. E. (2016). Situated learning and educational technologies: Theory and practice. In *Educational technologies in medical and health sciences education* (pp. 1-6). Springer.

Chazan D., Herbst P., Grosser-Clarkson D., Fleming E., Walkoe J. & Alibegović, E. (2018). Describing Curricular Materials for Mathematics Teacher Education in an Online, Rich Media Platform. In J. Silverman &

V. Hoyos (Eds.), *Distance Learning, E-Learning and Blended Learning in Mathematics Education*. Springer. doi: [https://doi.org/10.1007/978-3-319-90790-1\\_12](https://doi.org/10.1007/978-3-319-90790-1_12),

Cochran-Smith, M., Baker, M., Burton, S., Chang, W.-C., Cummings Carney, M., Fernández, M. B., Stringer Keefe, E., Miller, A. F. & Sánchez, J. G. (2017). The accountability era in US teacher education: Looking back, looking forward. *European Journal of Teacher Education*, 40(5), 572–588. <https://doi.org/10.1080/02619768.2017.1385061>

Darling-Hammond, L. (2006). Constructing 21st-century teacher education. *Journal of teacher education*, 57(3), 300-314.

Dotger, B. H. (2015). Core pedagogy: Individual uncertainty, shared practice, formative ethos. *Journal of teacher education*, 66(3), 215-226. doi: 10.1177/0022487115570093

Edwards-Groves, C. (2018). Knowing pedagogical dialogues for learning: Establishing a repertoire of classroom interaction practices as core teaching practice. *Contemporary pedagogies in teacher education and development*, 67-85. doi:10.5772/intechopen.78968

Falah, J., Khan, S., Alfalah, T., Alfalah, S.F.M., Chan, W., Harrison, D.K. & Charissis, V. (2014). Virtual Reality medical training system for anatomy education. *Proceedings Science & Information Conference, 2014*, 752-758

Forzani, F. M. (2014). Understanding “Core Practices” and “Practice-Based” Teacher Education: Learning From the Past. *Journal of Teacher Education*, 65(4), 357-368. doi:10.1177/0022487114533800

Gardner, M.R. and Elliott, J.B. (2014). The Immersive Education Laboratory: understanding affordances, structuring experiences, and creating constructivist, collaborative processes, in mixed-reality smart environments. *EAI Endorsed Transactions on Future Intelligent Educational Environments*, 1 (1), e6. doi: 10.4108/ fiee.1.1.e6

Gregory, S, Gregory, B, McDonald, M, Nikolic, S, Farley, S, O'Connell, J, Butler, D, Jacka, L, Grant, S, Jegathesan, JJ, McGrath, N, Rudra, A, Stokes-Thompson, F, Sukunesan, S, Zagami, J, Sim, J, Schutt, S, Gaukrodger, S,

Hearns M & Irving, L (2016). Exploring virtual world innovations and design through learner voices. *Proceedings, Ascilite 2016, Adelaide, South Australia*, 245-254

Gregory, S, Gregory, B, Wood, D, O'Connell, J, Grant, S, Hillier, M, Butler, D, Masters, Y, McDonald, M, Nikolic, S, Ellis, D, Kerr, T, De Freitas, Farley, H, Schutt, S, Sim, J, Gaukrodger, B, Jacka, L, Doyle, J, Blyth, P, Corder, D, Reiners, T, Stokes-Thompson, F, Linegar, D, Hearns, M, Cox, R, Jegathesan J, Sukunesan, S, Flintoff, K, & Irving, L (2015). New applications, new global audiences: Educators repurposing and reusing 3D virtual and immersive learning resources. *Proceedings, Ascilite 2015, Bentley Western Australia*, 121-13

Grossman, P., Compton, C., Igra, D., Ronfeldt, M., Shahan, E., & Williamson, P. (2009). Teaching practice: A cross-professional perspective. *Teachers college record*, 111(9), 2055-2100.

Grossman, P. & Dean, C. G. P. (2019). Negotiating a common language and shared understanding about core practices: The case of discussion. *Teaching and teacher education*, 80, 157-166.

Grossman, P. (2011). Framework for teaching practice: A brief history of an idea, *Teachers College Record*, 113(12), December, 2836-2843.

Hauser, M., & Kavanagh, S. S. (2019). Practice-based teacher education. In *Oxford research encyclopedia of education*.

Hegland, K. (1981). Fun and Games in the First Year: Contracts by Roleplay. *Journal of Legal Education* (31), 534-543

Hopwood, N. (2017). Practice architectures of simulation pedagogy: From fidelity to transformation. In *Exploring education and professional practice*, 63-81. Springer.

Hughes, C. E., Stapleton, C. B., Hughes, D. E. & Smith, E. M. (2005). Mixed reality in education, entertainment, and training. *IEEE computer graphics and applications*, 25(6), 24-30. doi:10.1109/MCG.2005.139

Ivbijaro, G., Brooks, C., Kolkiewicz, L., Sunkel, C., & Long, A. (2020).



Psychological impact and psychosocial consequences of the COVID 19 pandemic Resilience, mental well-being, and the coronavirus pandemic. *Indian journal of psychiatry*, 62(Suppl 3), S395. doi:10.4103/psychiatry.IndianJPsychiatry\_1031\_20

Ives, W. (1990). Soft skills in high tech computerizing the development of interpersonal skills. *Instruction Delivery*,4(2), 12-15

Kaufman, D. & Ireland, A. (2016). Enhancing teacher education with simulations. *TechTrends*, 60(3), 260-267. doi:10.1007/s11528-016-0049-0

Kemmis, S., Wilkinson, J., Edwards-Groves, C., Hardy, I., Grootenboer, P., & Bristol, L. (2014). *Changing practices, changing education*. Springer.

Kruse, S., & Gibson, D. (2011). Next generation learning challenge: Simulating teaching. *Educause Quarterly*. Retrieved from <https://er.educause.edu/articles/2011/12/next-generation-learning-challenge-simulating-teaching>

Kyaw, B. M., Saxena, N., Posadzki, P., Vseteckova, J., Nikolaou, C. K., George, P. P. , & Zary, N. (2019). Virtual reality for health professions education: systematic review and meta-analysis by the digital health education collaboration. *Journal of medical Internet research*, 21(1), e12959. doi:10.2196/12959

Lampert, M., & Ball, D. L. (1998). *Teaching, Multimedia, and Mathematics: Investigations of Real Practice. The Practitioner Inquiry Series*. Teachers College Press.

Maier, H.R. (2007). Meeting the challenges of engineering education via online roleplay simulations. *Australasian Journal Of Engineering Education* 13(1), 31-39.

Manburg, J., Moore, R., Griffin, D., & Seperson, M. (2017). Building reflective practice through an online diversity simulation in an undergraduate teacher education program. *Contemporary Issues in Technology and Teacher Education*, 17(1), 128-153.

Mantovani, F., Castelnuovo, G., Gaggioli, A. & Riva, G. (2004). Virtual Reality

Training for Health-Care Professionals. *CyberPsychology & Behavior*, 6(4),389-395.

Maschuw, K., Schlosser, K., Kupietz, E., Slater, E.P., Weyers, P. & Hassan, I. (2011). Do Soft Skills Predict Surgical Performance? *World Journal of Surgery*, 35(3),480-486

Matthew, K. I., Felvegi, E., & Callaway, R. A. (2009). Wiki as a collaborative learning tool in a language arts methods class. *Journal of Research on Technology in Education*, 42(1), 51-72. doi: 10.1080/15391523.2009.10782541

Miles, R., Lemon, N., Mathewson Mitchell, D. & Reid, J. (2016). The recursive practice of research and teaching: reframing teacher education, *Asia-Pacific Journal of Teacher Education*, 44(4), 401-414. DOI: 10.1080/1359866X.2016.1169502

Papert, S. (1980). Computer-based microworlds as incubators for powerful ideas. In R Taylor (Ed) *The computer in the school: Tutor, tool, tutee* (pp 203-210). Teacher's College Press.

Reckwitz, A. (2002). Toward a theory of social practices: A development in culturalist theorizing. *European Journal of Social Theory*, 5(2), 243-263. doi:10.1177/13684310222225432

Rishel, T. J. (2006). Rethinking the roles of mentor and mentee in the context of student suicide. *Mentoring & Tutoring*, 14(2), 207-226. doi:10.1080/13611260500493626

Savin-Baden, M., Gourlay, L., Steils, N., Tombs, G., & Mawer, M. (2010). Situating pedagogies, positions and practices in immersive virtual worlds. *Educational Research*, 52(2), 123-133

Schatzki, T. R. (B097). (1996). *Social Practices: A Wittgenstinian approach to human activity and the social*. Cambridge University Press.

Schön, D. (1983). *The Reflective Practitioner: How Professionals Think in Action*. Basic Books.

Schutt, S. & Linegar , D. (2013). *We Learn as We Go: What Five Years*

Playing with Virtual Worlds has Taught Us. *International Journal of Virtual and Personal Learning Environments*, 4(2), 124-136

Schwab, J. J. (1971). The practical: Arts of eclectic. *The School Review*, 493-542.

Straub, C., Dieker, L., Hynes, M., & Hughes, C. (2014). Using virtual rehearsal in TLE TeachLivE™ mixed reality classroom simulator to determine the effects on the performance of mathematics teachers. *2014 TeachLivE™ National Research Project: Year 1 Findings*. University of Central Florida: Orlando, FL. [http://teachlive.org/wpcontent/uploads/2014/10/2014\\_GR\\_Technical\\_Report\\_10\\_20\\_FINAL.pdf](http://teachlive.org/wpcontent/uploads/2014/10/2014_GR_Technical_Report_10_20_FINAL.pdf)

Sweeney, J., Milewski, A., & Amidon, J. (2018). On-ramps to professional practice: Selecting and implementing digital technologies for virtual field experiences. *Contemporary Issues in Technology and Teacher Education*, 18(4), 670-691.

Vander Ark, T. (2015). *Non-cognitive Skills: Bad Name, Really Important*. Getting Smart: <http://gettingsmart.com/2015/08/non-cognitiveskills-bad-name-really-important/>

Wearne, S. (2004). Role play and medical education. *Australian Family Physician* 33(10), 2004, 858.

Wilson, B. (1995). Metaphors for instruction: Why we talk about learning environments. *Educational Technology*, 35(5), 25-30

Wyllie, G., French, E., Dodd, N., Lee, Y., & Honey, M. (2020). How to bridge the theory-to-practice gap. *Kai Tiaki: Nursing New Zealand*, 26(1), 22-23. Retrieved from <https://www.proquest.com/docview/2358467682?pq-origsite=gscholar&fromopenview=true>

Zeichner, K., Payne, K. A., & Brayko, K. (2015). Democratizing teacher education. *Journal of Teacher Education*, 66(2), 122-135.

# *Using serious games to foster wellbeing literacy in higher education students*

NANCY AN, GILLIAN VESTY, CHRIS CHEONG & PAVITHRA SIRIWARDHANE

## ABSTRACT

---

Wellbeing refers to an individual's positive feelings and effective functioning. In a Higher Education (HE) setting wellbeing sets the foundation for student academic performance and overall resilience to meet future workplace challenges. Nevertheless, evidence suggests that HE students experience higher rates of distress than the general population, and graduates experience stress when they transition to the workplace.

Bogart, a newly developed serious game of business ethics, is being used to promote wellbeing in HE students and support the generation of student wellbeing literacy (WL). WL is a soft skill that empowers students through the ability to articulate their personally experienced wellbeing challenges and stressors. We argue that WL is a crucial employability skill for HE graduates. Our research proposes that serious games, such as Bogart can foster WL. Bogart's simulated work environment provides the perfect experimental vehicle for students to explore and test their responses to challenging workplace situations. Given that soft skills are fundamentally behavioural and real-life oriented, serious games, such as Bogart, provide a safe and cost-effective environment for HE students, to explore and

interact with sometimes extreme behaviours to help them construct, practice and reflect on their WL skills.

## INTRODUCTION AND BACKGROUND

---

Wellbeing refers to positive feelings and effective functioning of individuals (Magyar & Keyes, 2019). In the workplace, interpersonal collaboration is an essential employability skill (Andrews & Higson, 2008; Muhamad, 2012). While at the societal perspective, the importance of quality education, along with the necessity to promote health and wellbeing for all ages, is core to the United Nation's Sustainable Development Goals (Howden-Chapman, Siri et al., 2017). Student wellbeing is particularly critical in HE settings in motivating student engagement, peer-to-peer learning, overall academic performance and employability skills (Silverman, Underhile et al., 2008; Egan, O'Hara et al., 2021) and is an important and growing focus for HE administrators (Young, Macinnes et al., 2020). However, evidence increasingly shows HE students face significant distress compared with the general population (Turner, Scott-Young et al., 2019). Research reports that students commonly experience negative feelings and function poorly because of their mental state (McBeath et al., 2017). Student graduates are also reported to experience stress and anxiety when they move from university to the workplace (Jackson, 2015).

Instead of reactively responding to adverse wellbeing incidents, attention on the development of WL skills is important proactive management, fostering capabilities that empower students and minimise wellbeing-related issues. WL refers to the ability to use mindful language for wellbeing purposes (Oades & Johnston, 2017). With awareness and the ability to articulate their negative feelings, students with WL capabilities are more likely to seek help when needed and build positive relationships in their social networks (McBeath et al., 2017). WL empowers students and graduates to be aware of the potential risk of stressors during the transition to the workplace and to thrive as professionals in the long run. Individuals with WL can better adapt to new working environments and change the way they use language, facilitating them to adjust to new organizations more smoothly and collaborate more effectively with colleagues accordingly (Oades et al., 2020).

Unlike technical and academic skills, which can be taught and practised in the traditional instructor-centred classroom environment, WL is an employability skill that can only be built with proactive student-centred participation. A professional work environment similarly requires interpersonal collaboration. Thus engaging in pedagogical activities that support engagement in a social context is fundamental for developing employability skills (Andrews & Higson, 2008; Muhamad, 2012). Experiential learning in the relevant context can foster WL development. Hou et al (2021) highlight the key items that measure WL. These are posed as six questions as indicated in Table 1 and are useful for survey research:

|   | Items   |
|---|---|
| 1 | I have many words I can think of to communicate about wellbeing   |
| 2 | I know a lot about wellbeing  |
| 3 | I know how to improve my wellbeing  |
| 4 | I have the skills to understand information about wellbeing   |
| 5 | I have the skills to express myself about wellbeing   |
| 6 | I can communicate about wellbeing in multiple ways (e.g., writing, listening, drawing) to suit the needs of my audience |

*Table 1: 6 Items of Wellbeing Literacy (Hou, Chin et al. 2021)*

In this paper, we argue that serious games can foster wellbeing and WL. Serious Games are a relatively new concept to higher education and business research with calls for greater dialogue between the games industry and users, including uptake by educational facilities. Serious games are games designed with a purpose (Abt, 1987). Serious games are more than entertainment and have educational impact (Yusoff, Crowder et al., 2009; Ávila-Pesántez, Rivera et al., 2017). Bogart, a newly developed serious game of business ethics, is being used to provide a simulated work environment to test student responses to challenging people and conflict in the workplace. The immersive nature of the game arguably promotes student awareness and reflection of potential challenges that may impact wellbeing in the workplace. The game is used to determine the extent to which serious games, such as Bogart can encourage student reflexivity and the appropriate language choices that demonstrate their ability to make

decisions for not only ethical, but long-term wellbeing purposes. We posit that Bogart serious game enables students to improve their WL and be better prepared for their future workplace.

## GAME OVERVIEW

---

Bogart is an online simulation game designed to help educate accountants on the new code of ethics. While the game is designed to place students in the middle of an unfolding ethical dilemma, we are using the game to determine the capacity for this immersive experience to develop the WL of HE students before they enter the workplace. The serious game invites role-play as senior accountants within a fictional company, Bogart Technologies.

The game contains three acts corresponding to three days, with interactive activities for the players to accomplish. The typical duration of the gameplay is between one hour to one and half hours. On day one, the Bogart employees greet the player and provide an induction to Bogart Technologies. The player becomes familiar with company policies and is instructed how to use the technical console. The console facilitates the player to process accounting reports, check on their performance through their dashboard indicators and communicate with colleagues through video conferencing.

On day two, the players are required to process accounting reports based on Bogart policy documents. In particular, the credit policy. One of the customers, Belmont, is reported to have a debt of over 90 days and policy suggests that their account should be suspended based on the number of days overdue. However, the CEO, CFO and all other colleagues suggest to the player that they grant an extension. They argue that Belmont is a good customer with strong relationships with Bogart. The players are faced with an ethical dilemma on whether to follow their superiors' orders or to follow Bogart's accounting policies. At the same time, they know they will lose points if they do not 'grant an extension' which will also impact their own personal performance targets and bonus payments. The game continues with different challenges for the player, who determines their own journey through the game.

On day three, the players are suddenly called to an important staff meeting following an announcement made by the company Chairwoman. The Chairwoman reveals the undercover forensic accountant, who has been investigating the fraudulent activities that have been occurring at Bogart. Depending on the decisions made throughout the gameplay, the players will obtain additional feedback from the Chairwoman. The players might be praised for their ethical decision making, they might be warned for being unable to resist the pressures from colleagues, or they may be dismissed and reported to the professional bodies for their unethical decisions.

## FEATURES OF THE GAME

---

We argue that there are three main features of Bogart that help to develop students' WL and improve their employability skills. Each of these features are connected to fostering the WL items identified in Table 1. They are:

**Simulated workplace:** Most HE students have limited opportunities to experience the workplace and collaborate with colleagues before graduation. Bogart provides a safe and cost-effective simulated working environment in which students can explore from a first-person perspective. They can experience digital tools in a simulated office while interacting with virtual colleagues, make decisions, seeking help or asking questions. While immersed in the simulated workplace, students develop familiarity with the working environment and improve their confidence to build up positive relationships with colleagues and communicate for wellbeing purposes, extending into the real workplace.





*Image 1: Demo of the players' view in the simulated workplace*



*Image 2: Demo of the players' view in the simulated workplace*

**Feedback and Reward system:** What makes Bogart different from other games is that it rewards players for making wrong decisions. At the beginning of the game, the players are introduced to the two key performance indicators that drive their bonus: team performance and bad debt performance. Throughout the game, the CEO and CFO constantly

encourage the player to ignore risky customers, such as Belmont, who has an outstanding debt. Nevertheless, suspending Belmont would lead to negative performance targets. If they grant an extension, the player gets immediate praise from CFO and receives increased bonus points, encouraging them to continue making unethical decisions. Alternatively, obeying company policies and suspending the accounts would incur harsh criticism from the CFO and a reduced bonus. The players are surprised to find that the high-performance score results in punishment by the Chairwoman in the end. At the same time, the low performance and bonus result from making ethical decisions through the game, which leads to recognition and even promotion. The misleading feedback and confusing directions from senior managers in the game test the players' decision making under pressure. The challenging situations, and the surprising ending should motivate the player to reflect on their decision-making and behaviour during the game. Their language ability to communicate with colleagues about wellbeing and capability to improve wellbeing in the workplace can also be practised.

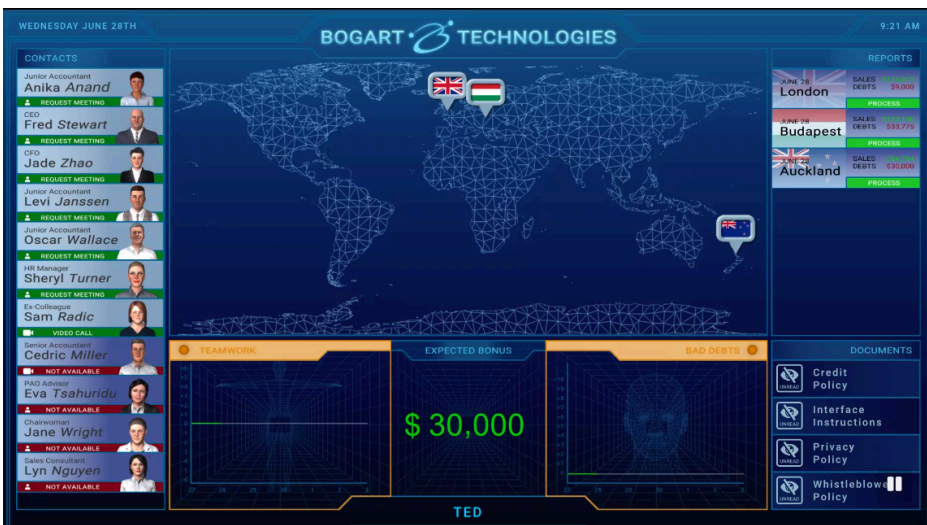


Image 3: Demo of the console, a digital tool to process reports, track performance targets, make video calls and check policy documents

**Individualized emotional experience:** There is no count-down timer set for the game. Thus, players are encouraged to take their own pace to

navigate the game and construct individualized experiences. For example, players may decide to consult other colleagues or reach out to policy consultants for information and advice. Although self-paced experience with flexible choices, and the intense pace of the in-game communication with virtual colleagues and requirements to accomplish tasks, the players are pressured to think and act quickly. In addition, the contradictory advice from different superiors and company policies tend to make players feel anxious and uncertain about the gameplay. The vivid facial expression of an angry boss adds to the stress. Throughout the game, the players are engaged emotionally, and the game tests the players' resilience and capability to resist pressure in the workplace. It also helps bring wellbeing into visibility and improves player awareness and understanding of potential stressors in the workplace.



*Image 4: Demo of interaction with a virtual colleague*

## IMPLICATIONS IN WL EDUCATION

---

WL, as an employability skill, is closely related to the workplace context (Oades, Jarden et al., 2021) and can only be built with proactive participation. Research relating to the development of WL is scarce. We propose that WL could be developed through simulation and serious games, such as Bogart, which provides an experiential learning context.

Wellbeing itself is an experience, closely related to personalised perception (Oades, Jarden et al., 2021). Employees' wellbeing is also influenced by their workplace context (Australian HR Institute, 2020). Thus, developing WL as an employability skill should consider being learner-centred and context-based.

In bringing awareness to wellbeing issues, Bogart provides personalized opportunities for students to not only identify but develop important resilience skills to stressors in the workplace. In giving greater visibility to wellbeing, mentors, educators and researchers can gain a more nuanced understanding of wellbeing literacy and its management. We test whether the "learning-by-doing" experience and "in-game" feedback, can help students transform and internalise experiences to become meaningful, practical WL skills. We propose that these innovative tools help students to build capabilities to deal with wellbeing issues in their future careers. Researchers need to continue to explore the links between serious games and fostering resilience and wellbeing.

## REFERENCES

---

Abt, C. C. (1987). *Serious games*. University Press of America.

Andrews, J. & H. Higson (2008). *Graduate Employability, 'Soft Skills' Versus 'Hard' Business Knowledge: A European Study*. *Higher Education in Europe* 33(4): 411-422.

Australian HR Institute (2020). *The state of wellbeing in Australian workplaces*.

Ávila-Pesántez, D., et al. (2017). Approaches for serious game design: A systematic literature review. *The ASEE Computers in Education Journal*, 8(3).

Egan, H., et al. (2021). Mindfulness, self-compassion, resiliency and wellbeing in higher education: a recipe to increase academic performance. *Journal of Further and Higher Education*: 1, 11.

Hou, H., et al. (2021). Wellbeing Literacy: Conceptualization, Measurement, and Preliminary Empirical Findings from Students, Parents and School

Staff. *International Journal of Environmental Research and Public Health* 18(4), 1485.

Howden-Chapman, P., et al. (2017). SDG 3: Ensure healthy lives and promote wellbeing for all at all ages. *A guide to SDG interactions: from science to implementation*. International Council for Science: 81-126.

Jackson, D. (2015). Employability skill development in work-integrated learning: Barriers and best practice. *Studies in Higher Education* 40(2), 350-367.

Muhamad, S. (2012). Graduate employability and transferable skills: A review. *Advances in Natural Applied Sciences* 6(6), 882-885.

Oades, L. G., et al. (2021). Wellbeing Literacy: A Capability Model for Wellbeing Science and Practice. *International journal of environmental research and public health* 18(2), 719.

Silverman, D., et al. (2008). Student health reconsidered: A radical proposal for thinking differently about health-related programs and services for students. *Student Health Spectrum*, 6, 4-11.

Turner, M., et al. (2019). Resilience and well-being: a multi-country exploration of construction management students. 1-12.

Young, T., et al. (2020). The impact of a wellbeing program imbedded in university classes: the importance of valuing happiness, baseline wellbeing and practice frequency. *Studies in Higher Education*, 1-20.

Yusoff, A., et al. (2009). A Conceptual Framework for Serious Games, IEEE.

# *TALi DETECT: a serious game for the assessment of early childhood attention*

SIMONE GINDIDIS & AZADEH FEIZPOUR

Attention encompasses an individual's capacity to sustain, direct, maintain, control their focus and behaviour. Appraisal of attentional skills are an important component of comprehensive childhood assessments where concerns for learning or behaviour are present as attention is strongly associated with the ability to learn, regulate emotions, socialise, and achieve (Diamond, 2013; Pondé et al., 2012; Ribner, 2020). Serious games offer clinicians an innovative method with which to assess attention development in young children that can increase motivation and engagement (Fleming et al., 2017; Khaleghi et al., 2021; Lumsden et al., 2016). Despite significant potential, adoption of serious games by clinicians is complicated by the need for tools that are informed by robust theory, have strong psychometric properties, are designed for the correct population with recent norms, and that are supported by rigorous research (American Psychological Association, 2020, 2021; Australian Psychological Society, 2018; Pratt et al., 2018). This benchmark for design and evidence is rarely met; resulting in few digital tools qualifying for clinical use (Byambasuren et al., 2019; Lui et al., 2017; Marshall et al., 2020; Torous et al., 2018; Wang et al., 2018).

The potential impact of digital health tools is more evident now in the wake of the COVID-19 pandemic than ever before. Digital health tools

such as serious games offer interactive, scalable resources that can be accessed in-person or remotely (Torous et al., 2020). In addition to the lack in availability of scientifically robust tools, real-world engagement with digital health tools such as mental health apps remains a challenge (Baumel & Kane, 2018; Gilbody et al., 2015; Torous et al., 2020). Given emerging literature indicates the quality and design of digital tools influence real-world user engagement (Baumel & Kane, 2018), high quality and evidence-based serious games may enable more accurate monitoring of client progress as well as adherence to intervention (Patel & Butte, 2020).

TALi DETECT (DETECT) is Software as a Medical Device (SaMD) successfully navigating the research-practice divide. TALi DETECT is a scientifically validated serious game designed to assess cognitive attention development in children aged 4-7 years currently used by Australian clinicians. The program assesses children's abilities across three core attention networks: selective, sustained, and executive attention (Fan et al., 2002). Children complete a series of gamified subtests (games) within set time or level limits and the games are designed based on established, standardised assessments of attention and executive function. The games are embedded in an imaginative storyline narrated by a character (avatar) that children select at the start of the game. Children are guided through the TALi world by their avatar and together they embark on an adventure that involves helping various animals and creatures in the game to complete tasks. Assessing children using these gamified, engaging stories is a basic form of stealth assessment (Georgiadis et al., 2018; Wang et al., 2015). Compared with traditional assessments, children lose sight of the fact they are being assessed; instead immersed in a fun gaming environment resulting in covert measurement of cognitive attention skills in a naturalistic setting.

Some of the TALi DETECT games are simple and easy, tapping into less sophisticated constructs such as one's visual search ability. Other games are more difficult to complete due to increased cognitive demand on more sophisticated constructs, such as one's executive function skills (inhibitory control and cognitive flexibility).



*Image 1: Welcome to TALi DETECT*

*Feed Whizz* is one of the TALi DETECT games that has been designed to assess a child's efficiency in visual information processing. This is accomplished by measuring response speed to randomly appearing visual targets. *Feed Whizz* is a gamified task based on the Simple Reaction Time paradigm in cognitive neuroscience literature (Stebbins, 2007). While children are playing this game, their responses enable exploration of the psychological factors underlying their stimulus-response behaviour and motor speed. Translating this task to a serious game enables young children to both understand the requirement of the test, and to complete the test without adult involvement with help from the avatar narrating the story.

The second and third games —*Look for Lobsters* and *Scan the Sky* — are designed to assess how quickly a child can locate targets in a crowded visual scene. Children search for a particular object amongst a complex array of objects enabling the evaluation of attention skills related to a child's visual search efficiency.





*Image 2: TALi DETECT Visual search subtest: Scan the Sky.*

*Find the Frog* is the fourth TALi DETECT game and is designed to assess how effectively a child can monitor tasks and divide their attention. Children monitor two events at the same time and make a considered response when prompted by the game. Performance on this task enables evaluation of visual search, vigilance, and divided attention skills.



*Image 3: TALi DETECT Divided attention subtest: Find the Frog*

The fifth game —*Don't Pat the Pig*— is designed to assess how long children can maintain their attention on a task. A series of animals (objects) are presented one at a time in the centre of the screen in a fixed order. Children are instructed by their avatar to watch the objects as they appear on the screen and respond by pressing a button for every object, except one. Performance on this game is an evaluation of attention skills related to vigilance and inhibition. This game is based on Go/No-go paradigm in cognitive neuroscience literature which when delivered in its original format, would be an arduous test for young children to complete. Gamification of this cognitive task in TALi DETECT has aided participation and compliance from children with what would otherwise be laborious neurocognitive test requirements.



*Image 4: TALi DETECT Sustained Attention to Response Task: Don't Pat the Pig.*

The sixth game —*Make Jam*— is designed to assess how effectively a child can inhibit an already initiated motor response or suppress an impulsive behaviour. Children are asked to respond based on the instructions presented by their avatar, pressing a left or right button if a target appears or withholding a response to the target if it is rapidly followed by a stop cue. This game is based on a very well-established cognitive paradigm called Stop Signal Task (Logan et al., 2014) which measures inhibitory ability.

The final TALi DETECT game is *Sort the Blocks* where children are asked to sort objects based on a particular sorting rule and switch from one sorting rule to another when prompted. This game is designed to assess how quickly a child can switch between different tasks and is based on a very well-established cognitive paradigm called the Dimensional Change Card Sort (Zelazo, 2006) which measures children's cognitive flexibility.

TALi DETECT – and serious games in general – offer two potential benefits: a uniform user experience, and a platform where a child's responses are

automatically recorded and scored. Although automatic response recording and scoring are foundational elements of most games (Ávila-Pesántez et al., 2017; Hanneghan & Tang, 2011), the impact of an engaging, objective, and accurate assessment provides a promising benefit to clinicians. Serious games therefore not only limit the likelihood of human error (Mrazik, Martin et al., 2015; Styck & Walsh, 2016) impacting test interpretation, the objective data collected during gameplay can aid clinical conceptualisation of development. The current version of TALi DETECT is not designed as a standalone tool for diagnosing developmental delays or neurodevelopmental disorders, instead providing additional data to a clinician's formal assessment process along with relevant clinical interviews, rating scales, cognitive and academic assessments.

To be used as a clinical-grade tool and counter the lack of evidence underpinning many digital health tools, a validation study was conducted. The validation study served two purposes. The first, was to evaluate the psychometric properties related to latent factor structure of TALi DETECT as a cognitive measure of attention. The study involved 340 neurotypical children and structural equation modelling results confirm that six of the games (cognitive subtests) provide foundational assessment of the three key attentional domains. This means that TALi DETECT features a comprehensive battery of diverse attention assessment tasks that facilitate estimation of a child's strengths and weaknesses across major domains of attention. This includes the ability to orient attention, referred to as selective attention in neuroscientific literature; the ability to maintain attention, referred to as sustained attention; and the ability to switch/regulate attention, referred to as executive attention (Raz & Buhle, 2006).

The second purpose of the validation study was to determine the convergent validity, reliability, and developmental sensitivity of TALi DETECT as an effective psychometric tool. Validity is a term used in psychology which is evaluated by investigating what psychological qualities or constructs are measured by a test. Validity can be assessed in several ways, and convergent validity for TALi DETECT was determined using correlations between TALi DETECT and a well-established measure of the same construct (attention); in this case, the Test of Everyday Attention, Second Edition Junior (TEA-Ch2J) (Manly et al., 2016). The TEA-Ch2J is a

measure of selective attention and sustained attention in children aged 5-7 years. Correlation analyses between five TALi DETECT games and comparable gamified subtests from the TEA-Ch2J confirmed convergent validity in the satisfactory range ( $-0.3-0.7$ ; Carlozzi et al., 2017).

Reliability is another important psychometric property for a test. Reliability is defined as the stability of scores obtained by a person when re-examined with the same test multiple times. Stability of test scores across time is important for longitudinal studies. High reliability in this context would normally be considered at around or larger than 0.7 and an intermediate reliability at around 0.6 (Fan et al., 2002). In testing the reliability of TALi DETECT, two attentional domain scores showed acceptable reliability (Selective and Sustained), while one showed lower reliability (Cognitive Flexibility).

Associations of test scores with age reflect the validity of the tests for measuring cognitive development during childhood. The effects of age on the three latent variables were examined. Age was positively associated with performance on selective attention, sustained attention, and cognitive flexibility; indicating TALi DETECT has good developmental sensitivity. Moreover, using the data collected through the study as a normative sample, TALi DETECT provides clinicians with an index for a child's attention-related cognitive capabilities relative to the reference group. This is clinically important, as it allows for identification of children with performance outside the typical range.

Overall, TALi DETECT provides an objective, performance-based measure of cognitive attention during a child's early years to detect attention vulnerabilities earlier in life. TALi DETECT illustrates the impetus for serious games developers to engage in ongoing research that is informed by robust scientific and clinical input to ensure high quality games are scalable, safe, and show real-world utility. Although avenues for future development of serious games in the digital therapeutic space are infinite (Fleming et al., 2017; Floryan et al., 2020), a lack of investment in evidence will likely result in the continued proliferation of digital health tools that are not fit for purpose.

REFERENCES

---

American Psychological Association. (2020). *APA Guidelines for psychological assessment and evaluation*. APA Taskforce on Psychological Assessment and Evaluation Guidelines. <https://www.apa.org/about/policy/guidelines-psychological-assessment-evaluation.pdf>

American Psychological Association. (2021). *APA Guidelines on evidence-based psychological practice in health care*. Workgroup of the Committee on Professional Practice and Standards COPPS) and the Board of Professional Affairs (BPA). <https://www.apa.org/about/policy/psychological-practice-health-care.pdf>

Australian Psychological Society. (2018). *Ethical guidelines for psychological assessment and the use of psychological tests*.

Ávila-Pesántez, D., Rivera, L. A., & Alban, M. S. (2017). *Approaches for Serious Game Design: A Systematic Literature Review*. 8(3), 11.

Baumel, A., & Kane, J. M. (2018). Examining Predictors of Real-World User Engagement with Self-Guided eHealth Interventions: Analysis of Mobile Apps and Websites Using a Novel Dataset. *Journal of Medical Internet Research*, 20(12), e11491. <https://doi.org/10.2196/11491>

Byambasuren, O., Beller, E., & Glasziou, P. (2019). Current Knowledge and Adoption of Mobile Health Apps Among Australian General Practitioners: Survey Study. *JMIR MHealth and UHealth*, 7(6), e13199. <https://doi.org/10.2196/13199>

Carlozzi, N. E., Tulskey, D. S., Wolf, T. J., Goodnight, S., Heaton, R. K., Casaletto, K. B., Wong, A.K., Baum, C. M., Gershon, R. C., & Heinemann, A. W. (2017). Construct Validity of the NIH Toolbox Cognition Battery in Individuals With Stroke. *Rehabilitation Psychology*, 62(4), 443–454. <https://doi.org/10.1037/rep0000195>

Diamond, A. (2013). Executive functions. In S. T. Fiske (Ed.), *Annual review of psychology* (Vol. 64, pp. 135–168). Annual Reviews. Fan, J., Mccandliss, B., Sommer, T., Raz, A., & Posner, M. (2002). Testing the Efficiency and

Independence of Attentional Networks. *Journal of Cognitive Neuroscience*, 14, 340–347. <https://doi.org/10.1162/089892902317361886>

Fleming, T. M., Bavin, L., Stasiak, K., Hermansson-Webb, E., Merry, S. N., Cheek, C., Lucassen, M., Lau, H. M., Pollmuller, B., & Hetrick, S. (2017). Serious Games and Gamification for Mental Health: Current Status and Promising Directions. *Frontiers in Psychiatry*, 7. <https://doi.org/10.3389/fpsy.2016.00215>

Floryan, M., Chow, P. I., Schueller, S. M., & Ritterband, L. M. (2020). The Model of Gamification Principles for Digital Health Interventions: Evaluation of Validity and Potential Utility. *Journal of Medical Internet Research*, 22(6), e16506. <https://doi.org/10.2196/16506>

Georgiadis, K., Van Lankveld, G., Bahreini, K., & Westera, W. (2018). Accommodating Stealth Assessment in Serious Games: Towards Developing a Generic Tool. *2018 10th International Conference on Virtual Worlds and Games for Serious Applications (VS-Games)*, 1–4. <https://doi.org/10.1109/VS-Games.2018.8493409>

Gilbody, S., Littlewood, E., Hewitt, C., Brierley, G., Tharmanathan, P., Araya, R., Barkham, M., Bower, P., Cooper, C., Gask, L., Kessler, D., Lester, H., Lovell, K., Parry, G., Richards, D. A., Andersen, P., Brabyn, S., Knowles, S., Shepherd, C., ... White, D. (2015). Computerised cognitive behaviour therapy (cCBT) as treatment for depression in primary care (REEACT trial): Large scale pragmatic randomised controlled trial. *BMJ*, h5627. <https://doi.org/10.1136/bmj.h5627>

Hanneghan, M., & Tang, S. (2011). Game content model: An ontology for documenting serious game design. *Developments in E-Systems Engineering*, 431–436. <https://doi.org/10.1109/DeSE.2011.68>

Khaleghi, A., Aghaei, Z., & Mahdavi, M. A. (2021). A Gamification Framework for Cognitive Assessment and Cognitive Training: Qualitative Study. *JMIR Serious Games*, 9(2), e21900. <https://doi.org/10.2196/21900>

Logan, G. D., Van Zandt, T., Verbruggen, F., & Wagenmakers, E.-J. (2014). On the ability to inhibit thought and action: General and special theories of an

act of control. *Psychological Review*, 121(1), 66–95. <https://doi.org/10.1037/a0035230>

Lui, J. H. L., Marcus, D. K., & Barry, C. T. (2017). Evidence-based apps? A review of mental health mobile applications in a psychotherapy context. *Professional Psychology: Research and Practice*, 48(3), 199–210. <https://doi.org/10.1037/pro0000122>

Lumsden, J., Edwards, E. A., Lawrence, N. S., Coyle, D., & Munafò, M. R. (2016). Gamification of Cognitive Assessment and Cognitive Training: A Systematic Review of Applications and Efficacy. *JMIR Serious Games*, 4(2), e11. <https://doi.org/10.2196/games.5888>

Manly, T., Anderson, V., Crawford, J., George, M., Underbjerg, M., & Robertson, I. (2016). *Test of Everyday Attention for Children Second Edition (TEA-Ch2)*. London, UK: Pearson.

Marshall, J. M., Dunstan, D. A., & Bartik, W. (2020). Clinical or gimmickal: The use and effectiveness of mobile mental health apps for treating anxiety and depression. *Australian & New Zealand Journal of Psychiatry*, 54(1), 20–28. <https://doi.org/10.1177/0004867419876700>

Mrazik, Martin, Janzen, Troy M, Dombrowski, Stefan C, Barford, Sean W, & Krawchuk, Lindsey L. (2015). Administration and scoring errors of graduate students learning the WISC-IV: Issues and controversies. *Canadian Journal of School Psychology*, 27(4), 279–290. <https://doi.org/10.1177/0829573512454106>

Patel, N. A., & Butte, A. J. (2020). Characteristics and challenges of the clinical pipeline of digital therapeutics. *Npj Digital Medicine*, 3(1), 159. <https://doi.org/10.1038/s41746-020-00370-8>

Pondé, M. P., Cruz-Freire, A. C., & Silveira, A. A. (2012). Relationship Between Learning Problems and Attention Deficit in Childhood. *Journal of Attention Disorders*, 16(6), 505–509. <https://doi.org/10.1177/1087054711423625>

Pratt, C., Baker, J., Kinsella, S., Banks, G., Macqueen, P., Dear, G., O'Keefe, V., Hagiliassis, N., Power, M., Howe, W., Senior, G., Kendall, I., & Mathews,



- R. (2018). *Practice guide for the use of psychological tests and instruments*. Australian Psychological Society.
- Raz, A., & Buhle, J. (2006). Typologies of attentional networks. *Nature Reviews. Neuroscience.*, 7(5), 367–379. <https://doi.org/10.1038/nrn1903>
- Ribner, A. D. (2020). Executive function facilitates learning from math instruction in kindergarten: Evidence from the ECLS-K. *Learning and Instruction*, 65, 101251. <https://doi.org/10.1016/j.learninstruc.2019.101251>
- Stebbins, G. T. (2007). Chapter 27—Neuropsychological Testing. In C. G. Goetz (Ed.), *Textbook of Clinical Neurology (Third Edition)* (pp. 539–557). W.B. Saunders. <https://doi.org/10.1016/B978-141603618-0.10027-X>
- Styck, K. M., & Walsh, S. M. (2016). Evaluating the prevalence and impact of examiner errors on the Wechsler scales of intelligence: A meta-analysis. *Psychological Assessment*, 28(1), 3–17. <https://doi.org/10.1037/pas0000157>
- Torous, J., Jän Myrick, K., Rauseo-Ricupero, N., & Firth, J. (2020). Digital Mental Health and COVID-19: Using Technology Today to Accelerate the Curve on Access and Quality Tomorrow. *JMIR Mental Health*, 7(3), e18848. <https://doi.org/10.2196/18848>
- Torous, J., Luo, J., & Chan, S. R. (2018). Mental health apps: What to tell patients. *Current Psychiatry*, 17(3), 21–25.
- Wang, K., Varma, D. S., & Prospero, M. (2018). A systematic review of the effectiveness of mobile apps for monitoring and management of mental health symptoms or disorders. *Journal of Psychiatric Research*, 107, 73–78. <https://doi.org/10.1016/j.jpsychires.2018.10.006>
- Wang, L., Shute, V., & Moore, G. R. (2015). Lessons Learned and Best Practices of Stealth Assessment: *International Journal of Gaming and Computer-Mediated Simulations*, 7(4), 66–87. <https://doi.org/10.4018/IJGCMS.2015100104>
- Zelazo, P. D. (2006). The Dimensional Change Card Sort (DCCS): A method of assessing executive function in children. *Nature Protocols*, 1(1), 297–301. <https://doi.org/10.1038/nprot.2006.46>

# *The Rosetta Wheel: a framework for designing behaviour change games*

JANE H COCKS, COLLEEN STIELER-HUNT & CHRISTIAN M JONES

## THE KEY TO DECIPHERING

---

On the 15<sup>th</sup> July 1799, in the city of Rosetta, Egypt, a party of French soldiers were working to strengthen defences when they uncovered a very large dark grey slab of stone in the course of their duties. It was immediately recognised as potentially important, given the varied inscriptions on one side of the slab. The Officer in charge of the defence site, Lieutenant Pierre Francois Xavier Bouchard, identified three distinct scripts: one in Ancient Greek, one in Egyptian Hieroglyphics, and the third in Egyptian Demotic script.

It quickly became apparent that the three inscriptions represented the same text in three different languages. Following translation of the Greek text it was revealed that the stone was an ancient decree commemorating Egyptian King Ptolemy V and was inscribed in his honour on 27th March 196 BC. Up until 1799, scholars and savants of the time had been unable to translate Egyptian hieroglyphics. However, the discovery of what was quickly named the 'Rosetta Stone' "*provided the key to deciphering*" (Adkins & Adkins, 2000, p.35) this unknown scripted language.

Today, the Rosetta Stone is a world-famous monument and is located at the British Museum in London where it was taken in 1802. It remains

a symbol of translation, code deciphering, and as a key to learning new languages.

## A TOOL FOR UNDERSTANDING

---

During the final game designer interview for this body of research, the conversation steered towards shared languages of design. It was the third section of the interview, where the framework was introduced, and the designer was explaining their design process, when they said this:

*"I also had conversations with people who don't understand games at all, and so, you know, you almost need a Rosetta Stone to kind of say, you know, that the goals of psychologists and educators and games designers are very similar. There's a lot of overlap, it's just we all speak different languages, and so, you know, looking at this it's like, oh my gosh, it's the Rosetta Stone, you know?"*

– and thus, the name of the Rosetta Wheel was born.

The Rosetta Wheel is a language translation tool. It provides a basis for game designers to understand psychological principles and apply them in their work, and likewise, it provides an insight for health professionals and subject matter experts into game design processes, techniques, and terminology. It is a tool that has been developed with designing in mind, but it can equally be used as a foundation for analysis, or a guide for post-development evaluation. The Rosetta Wheel is not an all-encompassing framework that attempts to summarise and communicate every aspect of psychology and game design in a prescriptive, reductive, or conclusive way. Rather, it is a starting point – like the Rosetta Stone – to begin to understand some meaningful concepts in the psychology of behaviour change, and how these concepts can link to and be applied to game design processes. The goal is for this framework to be a useful guide for future collaborative work in the field of designing games for positive health change.

## TOWARDS A FRAMEWORK

---

This article presents the Rosetta Wheel, the game design framework for games for health-behaviour change, developed iteratively through

research-led practice, and practice-led research (Smith & Dean, 2009). The Rosetta Wheel comprises 10 'Change Keys', as well as 19 'Key Considerations' supporting the development and design process.

This article starts by providing an explanation of how the Change Keys have been developed through Study 1 and Study 2 in this body of research. Definitions and explanations for all the components of change keys are provided in this section.

Included in this article is a single page visual representation of the Rosetta Wheel, visually designed to reflect the process of change through movement from one process to the next. This visual representation of the framework incorporates the psychological theoretical foundation as Wheel 1 and Wheel 2, with Wheel 3 representing the ten Rosetta Wheel Change Keys along with each design key. Following this visual representation of the Rosetta Wheel, each Change Key is outlined in detail.

Finally, the Key Considerations that designers should consider as part of their process when using the wheel are also outlined. These Key Considerations support the design and development processes involved in implementing the Rosetta Wheel for designing games for health-behaviour change.

## CREATING CHANGE KEYS

---

### Data Informed

---

The Rosetta Wheel has been informed by a research-led practice and practice-led research methodology (Smith & Dean, 2009). Study 1 is the research-led practice component. Study 2 is the practice-led research component.

The results of these two studies have directly informed the development of the third wheel of the framework – the Change Keys. These 10 Change Keys are tools for game designers to use in the design of games for health behaviour change. They are called 'keys' because they provide *"an aid to*

*interpretation or identification*" and *"a map legend"* ("Key", 2019) for design teams to work together, understand each other and map out a design.

The Change Keys are supported by Key Considerations. These are considerations, techniques, and processes that designers should consider as part of their process when using the Rosetta Wheel in the development and production cycle of games for behaviour change.

Study 1 resulted in a design analysis for each of the ten psychological processes of the Transtheoretical Model of Behaviour Change (TTM; Prochaska & DiClemente, 1982), based on the analysis of two existing games. The design analysis for each of these games focussed on *'what'* designing for each process involved, in terms of what game design patterns were used, and what their function for health behaviour change was within the game. These findings inform the ten Change Keys.

Study 2 represents an exploration of game design practice and has resulted in a practice analysis of game design decisions, processes, and techniques. This practice analysis focusses on *'how'* designing for each process takes place, and includes specific examples of links between design decisions, and the ten psychological processes of the TTM (Prochaska & DiClemente, 1982).

To show how the results of studies one and two directly inform the change keys of the framework, three examples from each study have been selected to demonstrate these links for the first psychological process, Consciousness Raising.

## Change Key Structure and Definitions

---

### *Key Components*

---

To provide a comprehensive framework for game design teams to work with, each Change Key provides definitions, context, explanation of what the key is, prompts for the designer, and an example from a game illustrating the Change Key. These are all represented by the following four components: Name of the key, Key Context, Design Key, and Designer

Prompt. These are each discussed and defined below. A detailed explanation of how these components have been developed is discussed in the next section 'Informing the Rosetta Wheel'.

### *Naming the Key*

---

Each Change Key name is a distilled reflection of what the Design Key is about, and how it can be achieved. The name is not a comprehensive representation of each Change Key, rather it indicates its conceptual essence.

### *Key Context*

---

Each Change Key is contextualised in relation to the TTM (Prochaska & DiClemente, 1982), and which stage of change, and process of change it relates to. The definition of the psychological process is also provided.

### *Design Key*

---

The Design Key is the summary of what designing for each psychological process involves in terms of game design goals, as well as how these goals can be achieved through design.

### *Designer Prompt*

---

The designer prompt is the summary of game design pattern categories that have been utilised for consciousness raising across both design analysis (study 1) and practice analysis (study 2). The prompt is framed as a question for design teams to facilitate an iterative creative process, and to question how design ideas and design patterns can give rise to the design goals of the key.

## Informing the Rosetta Wheel

---

### Study 1 – Game Analysis

---

#### *Identifying Key Components*

---

These two examples below show ‘what’ designing for consciousness raising involves. This includes identifying which design patterns and pattern categories were used (in brackets), and what function for health behaviour change they serve (underlined). These inform both the Design Key and the Designer Prompt in each Change Key.

#### *Example 1*

---

*Re-Mission*: The design patterns of resource locations (game elements > locations > resource locations) and power-ups (game elements > objects > power-ups) are reflected as Communication Taps within the game. In *Re-Mission*, Communication Taps are fixed location objects that when ‘tapped’ by the player character, provide information and resources. These features represent an important mode of information delivery relating to symptoms and the nature of specific cancer conditions, treatment information, important patient-doctor interactions, as well as self-management techniques. By providing didactic information, these Communication Taps heighten awareness and correct misconceptions about cancer condition, treatment, and self-management information. Interaction with the taps is a necessary requirement for completing each level and provides in-game rewards in the form of resources and information upon interaction.

#### *Example 2*

---

*Nevermind*: The design pattern of clues (game elements > objects > clues) is reflected in the presence of signposts throughout the game. At the beginning of the game, the player is guided by several signposts to ‘notice everything’, ‘interact with the world’, ‘collect memory photos’, and introduces the idea that the game will prompt change with a signpost to a

new area labelled 'shifting mind'. Following through this gate, the tutorial, now set in a darker game world environment, goes on to provide basic real-world advice using signposts, such as 'still yourself', 'take a moment', and 'stay calm even in the face of danger'. These signposts represent non-narrative based information for the player which signals firstly how to engage with the game world, in addition to prompting emotion regulation strategies. These signposts are didactic in nature, and they raise awareness and provide information about concrete strategies to use in the moment during play. The strategies assist with recognition and improvement of interoceptive awareness and emotional regulation.

## Study 2 – Design Analysis

---

### *Identifying Key Considerations*

---

These two examples below show 'how' designers approach designing for health behaviour change. The first example shows 'how' design decisions link to the psychological process of consciousness raising and what function for health behaviour change they serve (underlined), which informs both the 'Design Key' and the 'Designer Prompt'. The second example shows 'how' a design process informs a Key Consideration through design processes (underlined).

### *Example 1*

---

Participant Quote: *"Then bumping into asthma triggers because you didn't notice them or didn't care. Then realising that [character] peak flow goes down every time you do it. Then you start paying attention to, "Oh, so that furry animal, I have to stay away from."*

Practice Analysis: The designer indicated that information was communicated through role-play of other non-playable characters within the game to demonstrate the negative impact of asthma triggers on peak flow functioning. Interacting with these triggers raises awareness about triggers to avoid and may also correct misconceptions about the presence and impact of triggers. In this way, information was provided by way of



social learning theory (Bandura, 1977). Bandura asserts that *“in the social learning system, new patterns of behaviour can be acquired through direct experience or by observing the behaviour of others”* (Bandura, 1977, p. 3). By providing these experiential and observational moments, players can engage with the ‘social learning system’.

### *Example 2*

---

Participant Quotes: *“We start with exploring the problem space. Understanding what – sort of what I mentioned before. What is the unwanted effect in the real world, and who is at risk or affected by this thing? Is it a health condition? Is it injustice to a particular group or sub-population? Is it poor financial outcomes or opportunities? Where are we trying to head, right? What is the long-term positive gain in the world that we’re trying to affect?”*

*“I say start – knowing what your goal is, knowing the research, and also understanding the audience and the context that you’re trying to reach, and what it means to reach them and what’s authentic to them, especially for the topics we were talking about.”*

Practice Analysis: These quotes represent the Key Consideration “identify change outcome goal”, which follows the Change Keys. In this theme, participants explained their first step of the design process is to clearly identify the optimal change outcome goal. This process can be achieved through multiple means including engaging with client / stakeholder to understand needs, understanding the target audience, and exploring ideal outcomes.

THE ROSETTA WHEEL



Image 1: The Rosetta Wheel incorporating the five stages of change (wheel 1), the ten processes of change (wheel 2), and the ten Change Keys (wheel 3)

## CHANGE KEYS

---

### Change Key 1: Informative Experiences

---

#### *Key Context*

---

This change key context is in the pre-contemplation stage of change, and involves the psychological process Consciousness Raising, which involves *“Increasing awareness about the problem and improving the accuracy of information processing about the problem and about the self (e.g., seeking information, observations, interpretations)”* (Prochaska & DiClemente, 1982).

#### *Design Key*

---

Designing for this key involves increasing awareness, providing information, and correcting misperceptions through communication, experiences, feedback, outcomes, and engagement with the target topic.

#### *Designer Prompt*

---

How can the game elements, resource & resource management, game actions & events, game goals, or information provided during game roll-out, communicate or raise awareness of the issues or correct misperceptions relating to target topic and change goal through in-game experiences? How can you utilise relevant theories, such as social learning theory, to show the player an outcome rather than tell them information?

#### *Relevant Game Design Patterns Categories*

---

Across all mechanisms of action that fostered the consciousness raising process, there were five game design pattern categories identified as relevant for the process, as follows:

- Game Elements
- Actions and Events

- Narrative Structures, Predictability, and Immersion Patterns
- Resource & Resource Management
- Goals

## Change Key 2: Emotion Engagement

---

### Key Context

---

This change key context is in the pre-contemplation stage of change, and involves the psychological process Dramatic Relief, which involves *“Experiencing and releasing feelings about the problem and the solution (e.g., expressing and feeling upset at risk information)”* (Prochaska & DiClemente, 1982).

### Design Key

---

Designing for this key involves engaging emotions, challenging assumptions, shifting perspective, and providing insight through in game experiences, narrative, modelling, and the embodiment of diverse perspectives. It can also involve creating discomfort, challenge, prompt heightened/decreased arousal levels, and emotional relief, through the presence or absence of tension, predictability, and stimulating audiovisual and environmental design.

### Designer Prompt

---

How can your game elements, player actions, and goals provide emotional context and meaning relating to the target topic? How can player activity, narrative design, and diversity of perspectives involve the player emotionally, provide meaning, challenge assumptions, and create shifts in perspective relating to the target topic and change goal? Consider how your game world’s believability, predictability, presence/absence of tension, and varied environmental and audiovisual design, can provide emotional provocation to heighten player engagement.

### *Relevant Game Design Patterns Categories*

---

Across all mechanisms of action that fostered the dramatic relief process, there were six game design pattern categories identified as relevant for the process, as follows:

- Game Elements
- Actions and Events
- Narrative Structures, Predictability, and Immersion Patterns
- Goals
- Game Sessions
- Game Masters and Balancing

### **Change Key 3: Social Reflection**

---

#### *Key Context*

---

This change key context is in the pre-contemplation stage of change, and involves the psychological process Environmental Reevaluation, which involves *“Cognitive and affective assessments of how a personal behaviour might have an impact on the social environment (e.g., thinking the world would be a better place if everyone stopped smoking)”* (Prochaska & DiClemente, 1982).

#### *Design Key*

---

Designing for this key involves fostering player reflection on actions and outcomes in relation to the target topic, through providing feedback on player actions, providing repeated opportunities to develop and demonstrate capacity, to increasingly improve the frequency and accuracy of player reflection of how their actions impact in relation to the target topic.

### *Designer Prompt*

---

How can your game narrative, extent of player influence, and opportunities to succeed foster player reflection, encourage repetition and mastery of skills, and provide accurate feedback to the player to develop the accuracy of their self-reflection? How can increasing the degree of player influence of game session outcome, and heightening player perceptions of ability to succeed and overcome (when applicable), and empower the player to build competence and mastery, and reflect on that accurately?

### *Relevant Game Design Patterns Categories*

---

Across all mechanisms of action that fostered the environmental reevaluation process, there were three game design pattern categories identified as relevant for the process, as follows:

- Narrative Structures, Predictability, and Immersion Patterns
- Goals
- Game Masters and Balancing

### **Change Key 4: Observing Support**

---

#### *Key Context*

---

This change key context is in the pre-contemplation stage of change, and involves the psychological process Social Liberation, which involves *“Noticing social, policy or environmental changes that facilitate health behaviour change (e.g., noticing that society has changed in ways that make smoking cessation easier)”* (Prochaska & DiClemente, 1982).

#### *Design Key*

---

Designing for this key involves providing the player with prompts to pay attention, notice external supportive factors, and provide incentive in

relation to the target topic through both in-game and extra-game information, clues, feedback, and consequences.

### *Designer Prompt*

---

How can your game elements, such as clues, and learning curves, including consequences prompt your player to pay attention and notice information, strategies, and support in relation to the target topic? How can consequences, in-game and/or outside of the game, provide feedback and incentive to the player to observe external factors that may assist them with understanding in relation to the target topic?

### *Relevant Game Design Patterns Categories*

---

Across all mechanisms of action that fostered the social liberation process, there were two game design pattern categories identified as relevant for the process, as follows:

- Game Elements
- Meta Games, Replayability, and Learning Curves

### **Change Key 5: Introspective Shift**

---

#### *Key Context*

---

This change key context is in the contemplation stage of change, and involves the psychological process Self Reevaluation, which involves “A person’s cognitive and affective assessments of their self-image in relation to the problem behaviour (e.g., thinking that stopping smoking is part of being a responsible person)” (Prochaska & DiClemente, 1982).

#### *Design Key*

---

Designing for this key involves providing the experience of a different

perspective, embodiment of different behaviour, and the feedback to reflect on current self.

### *Designer Prompt*

---

How can you design your game's world, player actions, and game narrative to enhance character and story embodiment, challenge perspectives and attitudes, and give players the opportunity to see themselves through new experiences relating to the target topic and change goal? How can you use the player's belief that games are designed for (eventual) player success to challenge the player's perspective regarding their potential success relating to the target topic and change goal?

### *Relevant Game Design Patterns Categories*

---

Across all mechanisms of action that fostered the self reevaluation process, there were four game design pattern categories identified as relevant for the process, as follows:

- Game Elements
- Actions and Events
- Narrative Structures, Predictability, and Immersion Patterns
- Game Masters and Balancing

## **Change Key 6: Transforming Belief**

---

### *Key Context*

---

This change key context is in the preparation stage of change, and involves the psychological process Self Liberation, which involves *"A person's belief in their ability to change a particular behaviour and their commitment to act on that belief"* (Prochaska & DiClemente, 1982).



### *Design Key*

---

Designing for Self Liberation involves building capacity and heightening self-efficacy by providing repeated opportunities for success in relation to the target topic and change goal.

### *Designer Prompt*

---

How can you design your game world, player experience, and mastery opportunities to promote capacity building, and confidence / belief in capacity, through both challenge, and opportunity for success relating to the target topic and change goal?

### *Relevant Game Design Patterns Categories*

---

Across all mechanisms of action that fostered the self liberation process, there were four game design pattern categories identified as relevant for the process, as follows:

- Game Elements
- Goals
- Game Sessions
- Game Masters and Balancing

## **Change Key 7: Developing Substitution**

---

### *Key Context*

---

This change key context is in the action stage of change, and involves the psychological process Counter Conditioning, which involves *“The adoption of healthier behaviours as substitutes for problem behaviours”* (Prochaska & DiClemente, 1982).

### *Design Key*

---

Designing for this key involves providing challenge, incentive, and prompting mastery through providing repeated opportunities for development, experimentation, and player choice in relation to the target topic and change goal.

### *Designer Prompt*

---

How can your narrative structures, predictability, tension, and challenge provide opportunities for players to experiment, develop and adopt skills and behaviours in relation to the target topic and change goal? How can player goals, resource management, and the development of mastery inside the game relate to the target topic and change goal?

### *Relevant Game Design Patterns Categories*

---

Across all mechanisms of action that fostered the counter conditioning process, there were six game design pattern categories identified as relevant for the process, as follows:

- Game Elements
- Actions and Events
- Narrative Structures, Predictability, and Immersion Patterns
- Resource & Resource Management
- Game Masters and Balancing
- Goals

## **Change Key 8: Supportive Communication**

---

### *Key Context*

---

This change key context is in the action stage of change, and involves the psychological process Helping Relationships, which involves *“Relationships*

*characterised by openness, trust and empathy, which are supportive in regard to the problem behaviour and health behaviour change” (Prochaska & DiClemente, 1982).*

### *Design Key*

---

Designing for this key involves providing prompts, communication, and cues which support the awareness and development of skills relating to the target topic and change goal through in-game elements such as audiovisual clues, and extra-game information and consequences.

### *Designer Prompt*

---

How can your game elements, such as in game objects and clues, provide supportive prompts for the player relating to the target topic and change goal? How can you utilise meta-game information and consequences to provide trusted and supportive prompts for the player relating to the change goal?

### *Relevant Game Design Patterns Categories*

---

Across all mechanisms of action that fostered the helping relationships process, there were two game design pattern categories identified as relevant for the process, as follows:

- Game Elements
- Meta Games, Replayability, and Learning Curves

## **Change Key 9: Rewarding Choices**

---

### *Key Context*

---

This change key context is in the action stage of change, and involves the psychological process Reinforcement Management, which involves *“This occurs when a person is rewarded (by themselves or by others) for engaging in*

*healthy behaviours, or conversely when they are punished for not engaging in healthy behaviours” (Prochaska & DiClemente, 1982).*

### *Design Key*

---

Designing for this key involves providing encouragement (or discouragement), incentive (or disincentive), and rewards (or punishment) for the specific target behaviour or skill through repeated opportunities to practice and experiment, providing feedback, and changes in capacity, resources, and level of challenge.

### *Designer Prompt*

---

How can your game elements, actions and events, and narrative design provide rewards, incentive and feedback for the player relating to the target topic and change goal? How can you utilise resources and design game sessions to provide information and encouragement to the player about success and failure relating to the change goal?

### *Game Design Patterns Categories*

---

Across all mechanisms of action that fostered the reinforcement management process, there were seven game design pattern categories identified as relevant for the process, as follows:

- Game Elements
- Narrative Structures, Predictability, and Immersion Patterns
- Game Masters and Balancing
- Actions and Events
- Resource & Resource Management
- Game Sessions
- Meta Games, Replayability, and Learning Curves

## Change Key 10: Intentional Integration

---

### Key Context

---

This change key context is in the maintenance stage of change, and involves the psychological process Stimulus Control, which involves *“When a person makes changes to their environment so that cues for problem behaviours are reduced and cues for healthier behaviours increased”* (Prochaska & DiClemente, 1982).

### Design Key

---

Designing for this key involves giving players control of their environment, providing opportunities to disengage with cues for non-target behaviour, experiment with different actions and paths throughout the game, through providing repeated opportunities to master making changes to their place in the environment to control their exposure.

### Designer Prompt

---

Question prompt for designer including key design patterns

### Relevant Game Design Patterns Categories

---

Across all mechanisms of action that fostered the stimulus control process, there were six game design pattern categories identified as relevant for the process, as follows:

- Game Elements
- Actions and Events
- Narrative Structures, Predictability, and Immersion Patterns
- Resource & Resource Management
- Goals
- Game Masters and Balancing

## KEY CONSIDERATIONS

---

### Broader Context

---

The Rosetta Wheel is a design tool for designing games for health behaviour change and is suggested to be used throughout the design phase of a game development process. Design teams can choose to focus on one or more parts of the Rosetta Wheel Framework, depending on what their design goals are.

There is a broader context in which the Rosetta Wheel, which only focusses on game design techniques that foster psychological processes, is situated. There are three additional broad themes which can support designing games for health behaviour change, which were informed by Study 2. These three broad themes are Development Considerations, Design Processes, and the Design Toolkit. These are each defined below and include the key considerations for each context.

Design teams can use the Rosetta Wheel Framework in multiple ways, from early in development as a guidance tool to inform theoretical foundations, incorporation of expertise, and ethical considerations; or as a more specific design tool when they are designing for a specific outcome and would like to focus on one or two change keys. Here is an example of how two design teams can utilise the Rosetta Wheel Framework in two different ways:

1. Design Team A is from a large game development studio. They have a very refined workflow and game development cycle. They do not need any input into their processes of development. They are utilising the Change Keys in the Rosetta Wheel only, as prompts for behaviour change design in their early design ideation sessions.
2. Design Team B is a small independent development studio creating a serious game for health-related change for the first time. They have not approached a serious game before. They will read through the whole Rosetta Wheel Framework comprised of the Change Keys and the Key Considerations and will use these as prompts to inform behaviour change design as well as the overall

game development cycle.

There are a multitude of ways the Rosetta Wheel Framework can be utilised, from minimally informing early ideation, to providing a checklist for the overall development cycle. The next section will outline the Development Considerations, Design Processes, and the Design Toolkit, which make up the Key Considerations of the Rosetta Wheel Framework.

## Development Considerations

---

This context details broad processes and considerations that are important across the overall project development stages, including e.g., research, stakeholder engagement, business models, scoping, documentation, and collaborative processes. The Development Process is the overall context in which game design practice is situated and will provide key considerations in support of the Rosetta Wheel. All development considerations reflect findings from Study 2. Condensed summaries are presented here.

### *Identify business model*

---

Identify the business model, stakeholders, monetisation considerations, and client motivations. This process typically precedes but influences game design processes and techniques, dependent on these contingent business model factors.

### *Conduct cycle of discovery*

---

Immerse into the subject matter to increase familiarity and knowledge of the problem space. This process precedes formal design processes and has the function of increasing familiarity and knowledge of the subject matter. This phase influences game design processes.

### *Consider ethics and do no harm*

---

Consider the ethics of the game design and player involvement as a priority throughout all stages of design, playtesting, and development to eliminate

potential harm. Ethical considerations must be given at the beginning of the design cycle. When dealing with ethically challenging subjects, designers can adapt topic material and present it as an analogy. Given there may be varying ethical codes depending on target areas, design teams should consult with subject matter experts in the target topic area and discuss ethical considerations during early phases of design.

### *Consider using frameworks*

---

Using frameworks, whether formalised theoretical frameworks, or in-house design/process frameworks, is an important step in the preliminary stages of the development process.

### *Useful frameworks that expert designers recommend exploring:*

---

- Mechanics, Dynamics, Aesthetics framework (Hunnicke, LeBlanc, & Zubek, 2004)
- Social Cognitive Theory (Bandura, 1989)
- Extended Parallel Process Model (Witte, 1992)
- Intrinsic / Extrinsic Motivation theory (Ryan & Deci, 2000)
- Transtheoretical Model (Prochaska & DiClemente, 1982)
- Behaviour Change Wheel (Michie, Atkins, & West, 2015)
- Self Determination Theory (Ryan & Deci, 1985)
- Human Centered Design (Cooley, 2000)

### *Collaborate with subject matter experts and diverse perspectives*

---

Incorporate diverse voices from the target population, people with lived experience, subject matter experts, psychologists, social workers; through a variety of methods including interviews, observations, participatory design, and collaboration. Incorporating diverse perspectives and disciplines will provide increased insight into both the problem space, and the potential solution. This development process informs design processes



and, as such, it forms part of the overall development process to consider prior to direct design work.

### *Define game scope*

---

In the context of the business model, consider the scope of possibility in your games design in relation to the client goals, included theories, allocated budget, development time. Identify the boundaries of what is expected and what is possible within the scope of resources. This development process is dependent on business model, and influences design processes and direction.

### *Playtest and iterate*

---

Playtest and iterate on your game design by play testing it with the target population or audience. Where appropriate, determine playtesting outcomes using objective indicators (such as in-game analytics) as they may be more reliable than direct feedback from play testers. This development process is involved in and informs the iterative design process.

### *Document your process and design*

---

Develop documentation of your design processes. This development process took place both prior to, and during the design phase for all participants.

### *Useful documentation that expert designers recommend including are:*

---

- Agreed messaging
- Flowchart of narrative design
- Mapping outcome goals to game mechanics
- Game blueprint / vision
- Metric / goal sheet to assist workflow and completion

## Design Processes

---

This context represents game design processes that take place over time and relates to how and by which processes the game is designed, including e.g., the process for mapping outcome goals to design, designing for user experience, creating “juicy” fun, and identifying barriers to change. The design process context operates within the scope of, and is influenced by, key considerations specified in the development process, and provides key considerations in support of the Rosetta Wheel. All design process considerations reflect findings from Study 2. Condensed summaries are presented here.

### *Identify change outcome goal*

---

Identify and define the optimal change outcome goal as a first step in your design process. To achieve this, game design teams need to engage with client / stakeholder to fully understand needs, understand the target audience and explore ideal outcomes. This key consideration is of high importance, takes place as a first step in the design process, and informs all following aspects of the design process.

Design Team Reflection Prompts to identify change outcome goal:

- What function does the game serve?
- Do we need to educate?
- Do we need to motivate?
- Do we need to persuade?
- Do we need to provide feedback?

### *Discover change techniques*

---

Once the outcome goal is known, commence a discovery phase exploring effective techniques for the change outcome goal. This process is achieved through reviews of research, guidelines, consulting with subject matter experts and engaging in participatory design. This key consideration is high

in importance and takes place following the identification of the outcome goal, and further informs all following aspects of the design process.

### *Map techniques to design*

---

Map the identified change goal along with established techniques for change, to game design elements. This process is achieved through brainstorming, iterating, and exploring potential game design elements that engage the player in the change technique which then leads to the outcome goal. This key consideration relies on the identification of the outcome goal, and the identification of established techniques for change. Detailed design prompts to foster brainstorming at this stage can be found for each Change Key in the designer prompt section.

### *Consider player perspective & user experience*

---

Consider the players perspective and user experience when designing the game. This process includes considering all aspects of the experience, from aesthetics, the messaging, the difficulty, the 'feeling', and whether it is a positive / negative / enjoyable experience. Considering player perspective and user experience throughout your design process will assist with designing a game that 'feels' right and creates the intended experience.

### *Design "juicy" fun*

---

Design for the engaging, entertaining, 'juicy' fun aspect of gameplay. The fun design element is important as players may not begin or continue engaging with the game unless it provides them with an enjoyable experience. This key consideration involves considering 'juicy' fun during the design process, through to iterative playtesting and feedback.

### *Be flexible in design direction*

---

Remain flexible and avoid having fixed ideas with regards to design direction during the design process. Design teams should be willing to iterate on initial design ideas in accordance with feedback. This design

process involves seeking peer and player feedback throughout the design process to test design elements and user experience.

### *Design narrative intentionally*

---

Utilise narrative in an intentional way to communicate the target topic and change goal. Narrative design refers to the environmental design of the game, including everything that players experience holistically, from text, story and characters to environmental contexts, objects, cues, and audiovisual effects. This design process involves considering target psychological processes when designing narrative and worldbuilding in the game.

### **Design Toolkit**

---

This context represents a specific game design decision, technique, tool, or resource that can be utilised in a games' design, including e.g., incorporating narrative for a specific purpose, ethical considerations, and providing opportunities for failure. The design toolkit context is situated within the design process context and will provide key considerations in support of the Rosetta Wheel. All design toolkit considerations reflect findings from Study 2. Condensed summaries are presented here.

### *Consider purpose-driven narrative*

---

Utilise narrative to achieve a specific aim for the players, from prompting an emotion, to providing learning or perspective shifting cues.

### *Emotion & Empathy*

---

Create stories that players can relate to, either through characters or contexts. This heightens player character/context empathy and can shift perspective when placed in new contexts/characters.

### *Feedback*

---

Narrative can be a vehicle for feedback through providing dynamics of story change following choices or actions.

### *Learning & Memory*

---

Information presented within a story format is learned faster and remembered more readily than information presented as disconnected facts which requires higher cognitive load. When learning and remembering are required for the target topic and change goal, design teams should consider linking information within a narrative.

### *Representation & Identification*

---

Characters or contexts that players can identify with heighten emotional engagement. This can foster a sense of connection and emotional responsiveness.

### *Meaning*

---

Incorporating deeper meanings and belief systems through in-game story and lore allows players to experience something new, shift perspectives, and provide transcendental experiences for the player. It can also provide heightened understanding of known concepts.

### *Reframe / Subvert*

---

Incorporating reframing or subversions of common tropes and stereotypes through narrative can impact the player emotionally, enhance self-efficacy, and provide increased motivation around the target topic and change goal.

### *Provide opportunities for failure*

---

Provide time and choices for players to fail, make mistakes, and

experiment with different game progress and action options. Furthermore, this design strategy involves giving the player the capacity to make further attempts to approach different choices. Providing opportunities to make wrong choices allows players to engage their curiosity and learn through failure.

### *Allow space for reflection and ambiguity for interpretation*

---

Provide enough ambiguity and 'gaps' that players are prompted to reflect on meaning and develop their own interpretations. By providing cues, ambiguous choices, and room for interpretation rather than concrete indications, player engagement can be heightened, and space is created for reflection both within and outside the game.

### *Layer aesthetics for emphasis and priming*

---

This key consideration involves considering the use of aesthetic layering to amplify or emphasise particular points or prime players for an upcoming moment. This technique can involve utilising music, sound design, dialog/text effects, audiovisual effects, layering and repetition of visual motifs, can all enhance player curiosity, stimulate a feeling, heighten engagement, lead players in a specific direction, and just be 'part of their journey'.

## CONCLUSION

---

The Rosetta Wheel Framework is a starting point – hopefully a useful one – for design teams of games for behaviour change. It is a living framework in the sense that it is not meant to be a finite piece of unchanging work. This body of research began as it means to continue; continually informed by research and practice and contributing to the body of literature around designing games for positive change in individuals and society in the context of health behaviour.

In concluding this body of work, the future directions are clear. The practice-led research and research-led practice that led to this first Rosetta

Wheel Framework should continue. Furthermore, it should continue beyond the scope of one individual's contributions.

I would like to make a call for game design teams to implement the framework, add to it, revise approaches and develop it based on continued scholarship and practice.

Implementing this framework could cover a variety of approaches, such as:

- Does the Rosetta Wheel Framework facilitate communication between multidisciplinary teams through a shared understanding of game design and psychology?
- Which Key Considerations are most useful in development, and at which stage?
- How can the Rosetta Wheel Framework be used to redesign games to be more effective at health behaviour change?
- Are games designed with the Rosetta Wheel Framework effective with the change goal?
- Can the Rosetta Wheel Framework be used to analyse existing games to predict efficacy?

I invite researchers, designers, players, subject matter experts, and all the other multidisciplinary game design team members to test this framework and report on its suitability. I invite them to provide valuable critique. I invite revisions, inclusions, experiments. I invite them to keep building it with me. The Rosetta Wheel Framework is just the beginning of a practical and comprehensive shared language of psychology and game design for the purpose of designing behaviour change games. By continuing as it was started, this field of endeavour will be in an increasingly fertile ground for creating experiences that make a positive impact on people and the world.

## REFERENCES

---

Adkins, L., & Adkins, R. (2000). *The keys of Egypt: the obsession to decipher Egyptian hieroglyphs*.

- Bandura, A. (1977). *Social Learning Theory*. New York City: General Learning Press.
- Bandura, A. (1989). Human Agency in Social Cognitive Theory. *American Psychologist*, *44*(9), 1175–1184.
- Bandura, A. (1989). Social Cognitive Theory. (R. Vasta, Ed.), *Annals of Child Development*. Vol. 6. *Six Theories of Child Development*. JAI Press.
- Cooley, M. (2000). Human-Centered Design. In *Information Design*. MIT Press.
- Hunicke, R., Leblanc, M., & Zubek, R. (2004). MDA: A formal approach to game design and game research. *AAAI Workshop – Technical Report, WS-04-04*, 1–5.
- Key. (2019). Retrieved from <https://www.merriam-webster.com/dictionary/key>.
- Michie, S. F., Atkins, L., & West, R. (2015). The behaviour change wheel: a guide to designing interventions.
- Prochaska, J. O., & DiClemente, C. C. (1982). Transtheoretical therapy: Toward a more integrative model of change. *Psychotherapy: Theory, Research & Practice*, *19*(3), 276–288. <https://doi.org/10.1037/h0088437>
- Ryan, R. M., & Deci, E. L. (1985). *Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being* *Self-Determination Theory*. Ryan.
- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*(1), 54–67.
- Smith, H., & Dean, R. T. (2009). *Practice-led research, research-led practice in the creative arts*. *Practice-led Research, Research-led Practice in the Creative Arts*. Edinburgh University Press.
- Witte, K. (1992). Extended parallel process model. *Communication Monographs*, *59*.





# *Differential exercise patterns between 'hardcore' and 'casual' players of Pokémon GO and Harry Potter: Wizards Unite*

KATHLEEN YIN, MATTHEW D. LEE, KIRAN IJAZ, JAMES SMITH & LOUISE A. ELLIS

## ABSTRACT

---

We report data from an online mixed-methods survey that assessed the exercise routine and play experiences of players for *Pokémon GO* (PGO) and *Harry Potter: Wizards Unite* (HPWU), two augmented reality (AR) games that encourage outdoor walking. Both games significantly increased the extent of exercise for players, however exercise patterns differed between the two games' player bases, with further variations between self-identified 'hardcore' and 'casual' players. Players also reported on key design differences between the games that had a major influence on their outdoor walking behaviour. We propose that these findings could highlight design practices that can affect exercise outcomes in exergames in future works.

**Keywords:** Serious game, exergame, Pokémon GO, Harry Potter: Wizards Unite

## INTRODUCTION

---

Sedentary lifestyle and its consequential obesity are now global issues, with millions at risk of health conditions that may be exacerbated by obesity (Hruby & Hu, 2014). 'Exergames', defined as games used with the purpose of encouraging its users to increase physical exercise levels, have been developed both academically and commercially for arcade machines (Bogost, 2005), consoles (Boulos, 2012), virtual reality (Warburton et al., 2007), combined with the use of treadmills or other exercise equipment (Ahn et al., 2009; Bolton, Lambert, Lirette, & Unsworth, 2014), and handheld devices such as mobile phones (Laine & Suk, 2015; Witkowski, 2013). However, while exergames have shown promise in a controlled classroom setting (Fogel, Miltenberger, Graves, & Koehler, 2013) and in children (Maloney et al., 2012), such games have not consistently succeeded at increasing physical exercise when used for general adult consumers.

In contrast, *Pokémon GO* (PGO), a free-to-play mobile game developed by Niantic and released in 2016, was one of the most successful exergames in recent years. In the first few months after launch, as many as 45 million people played PGO every day (with 380 million playing at least once a month), with several early studies finding that PGO increased walking in all players regardless of socioeconomic factors such as ethnicity or income (Althoff, White, & Horvitz, 2016; Barkley, Lepp, & Glickman, 2017). The game's physical exercise effect was also greatest in individuals who had previously led more sedentary lifestyles (Wong, 2017). In 2018, Niantic released *Harry Potter: Wizards Unite* (HPWU), a game very similar to PGO but with a Harry Potter theme. HPWU did not achieve the same level of commercial or physical exercise success as PGO, despite nearly identical gameplay and user interface. While the two games are compatible in the intended physical outcome, this discrepancy in player uptake is interesting and warrants investigating the differences in player experience between the two games. Moreover, self-identified 'hardcore' and 'casual' players also demonstrate quantitatively different exercise patterns, suggesting the interplay between player habits and design factors is integral in the efficacy of exergames focused on outdoor exercise.

Here we present a study that examines the differential exercise patterns for players of PGO and HPWU. Our research objectives are:

- Do players with different self-identification (e.g., Hardcore, casual) have different exercise profiles in these two games?
- Why do players with different self-identification behave differently in these games?
- Do players have different exercise profiles between PGO and HPWU?
- What aspects of the games' different designs contributed to these exercise profiles?

With these results, we hope to highlight designs that can increase motivation for players to conduct physical exercise, while also addressing the existing play pattern and mindset of different populations.

### Related Works on Exergames

---

There is well-established literature demonstrating the potential for video games to improve physical activity, social interactions, and mental health (Chao, Scherer, Montgomery, Wu, & Lucke, 2015; Jones, Scholes, Johnson, Katsikitis, & Carras, 2014; Peng, Crouse, & Lin, 2013; Ryan, Rigby, & Przybylski, 2006; Şimşek & Çekok, 2016). Exergames were found to be effective in different settings such as clinical rehabilitation (Chao et al., 2015; Şimşek & Çekok, 2016), amongst young children (Garde et al., 2016), and promoting general exercise (Peng et al., 2013). Extensive comparisons have been established between exergames and standard exercise to demonstrate how exergames were able to produce physiological exertion similar to normal exercise. Based on multiple parameters such as heart rate (Bonetti, Daniel G, Danoff, & Miller, 2010), oxygen consumption (Penko & Barkley, 2010), and electrocardiogram readings (Maddison et al., 2007), exergames in general demonstrated measurable physiological benefits comparable to standard light exercise such as walking (Rahmani & Boren, 2012).

PGO and HPWU can be considered as exergames as they both use location-based GPS and in-built phone speedometers to track player location and movement, with walking a certain amount of distance being required to accomplish in-game achievements. In that sense, outdoor walking is the gameplay, as progress in the games cannot be made if the player remains stationary. Outdoor walking is also the main way to find interactive items and obtain resources, thus allowing one to keep playing the game. Within as little as 6 months after release, PGO was already recognised to be a very complex and contextualised behavioural intervention, with the game increasing the exercise duration across all of its players regardless of socioeconomic status (Althoff et al., 2016; Clark & Clark, 2016).

During the COVID pandemic, PGO and HPWU also demonstrated an ability to act as buffers against mental health concerns (Ellis et al., 2020), as well as maintaining exercise levels amongst its players well above the weekly exercise requirements recommended by the World Health Organisation. While players of the two games reported an average of 7.5 hours of outdoor exercise per week before the pandemic, they reported an average of 6.5 hours during the pandemic and associated the maintenance of exercise routines with game play (Ellis et al., 2020). Such studies demonstrated that the two games have a definite relationship with improving or maintaining levels of outdoor physical exercise, even though durations of severe physical isolation such as during COVID lockdowns.

We therefore wish for this publication to present an understanding on *why* PGO and HPWU were effective in encouraging exercise, viewed from the perspective of design factors and user experience. Moreover, as very few studies have been conducted on HPWU, we wanted to know if design differences between these two games caused exercise differences in the two player populations. Lastly, as a prequel to the work done during the COVID pandemic, this paper examines how people exercised with these two games before the pandemic, when contextual factors such as remote play features (installed by Niantic during 2020 to reduce the need for outdoor exercise) and physical lockdown did not significantly influence outdoor exercise behaviour.

## Related Works on Self-identified Player Classifications

---

Our paper also found differences in quantitative and qualitative data from people who self-identify as different kinds of 'gamers', which is a way for a game player to identify their usual video game play pattern and mindset (Ip & Jacobs, 2005). People who self-identify as hardcore gamers invest a significant portion of free time and resources to games, while also often possessing more knowledge, skill, and understanding of game industry and culture (Kirman & Lawson, 2009; Tuunanen & Hamari, 2012). Those who identify as casual gamers only play on a casual, on-and-off basis, often paying little attention to the subtleties or content of the medium (Kirman & Lawson, 2009; Tuunanen & Hamari, 2012). There are 2 more groups that were investigated in our study: 1) In-between gamers, those who behaved somewhere between the two extremes of hardcore and casual gamers and recognised themselves as being in that position, and 2) No-identification gamers, who have not established a self-identification with the medium (Manero, Torrente, Freire, & Fernández-Manjón, 2016). This type of segmentation exists separately from other traditional gamer classifications, such as Bartle's famous taxonomy on game player types (Bartle, 1996) that focuses on how the player interacts with the game and with other players. Instead, our classification reflect how one perceives the extent of one's own involvement, the pattern of one's own behaviour, and the willingness to correlate oneself with a specific population of players.

Work on the validity of using this kind classification on PGO and HPWU does have precedent. Hardcore, in-between, casual, and no-identification players reported different constraints and enablers that affected how much they played the games (Smith, Lee, Ellis, Ijaz, & Yin, 2021), while each player group also exhibited differences in user experience between PGO and HPWU (Smith et al., 2021). For example, hardcore PGO players reported experiencing a lack of confidence regarding mastering PGO, but this was not observed for hardcore HPWU players. Conversely, casual HPWU players complained about the game requiring people to walk for too long and they did not have enough time to do daily tasks or return to a location on time, but casual PGO players had no such concerns (Smith et al., 2021). This indicates that people self-identifying as different kinds of

gamers experience PGO and HPWU differently. As gameplay in both games is directly translated to outdoor exercise, we have reasons to suspect these player groups require different design elements to encourage them to exercise and to continue their routine.

## METHODS

---

### **Pokémon GO and Harry Potter: Wizards Unite**

---

In both games, players explored a cartoon-art version of the real world based on Google Maps data (Image 1). Significant landmarks, such as shopping malls, libraries, or train stations, are symbolised by tall buildings where players can group up to conduct group challenges (seen in Image 1 as tall, coloured buildings called Gyms in PGO and tall elongated buildings in HPWU called Fortresses). Minor landmarks, such as a piece of wall art or a small suburban park, are represented by a small teal cube in PGO called Pokéstops and a small blue building in HPWU called Inns. These locations provide resources to players and are renewable after a certain number of real-time hours. Players must walk to the vicinity of these landmarks to activate these in-game features, enforcing the need for outdoor exercise.

While walking, players will also encounter creatures in both games. PGO players catch Pokémons, small animals that can be levelled up to better conduct challenges, while HPWU players catch Foundables, which are people or significant items from the Harry Potter franchise. These creatures have various statistics and are vital for play progression. Lastly, both games also offer a 'gift box' to players after walking a certain amount of distance (such as 5 kilometers), with PGO hatching a Pokémon Egg and HPWU opening a Portkey. These items may present rare or unique Pokémons or Foundables, further encouraging walking. Daily and weekly goals for distance walked are also present to give a small reward at the end of the week based on total distance walked in the past 7 days.

Once players encounter a Pokémon or Foundable in their travels, they can catch it on-screen. PGO players throw a ball at the Pokémon through a finger flick gesture, while HPWU players trace a sigil on their screen. Once captured, the player returns to the overworld map.



*Image 1: Pokémon GO (left) and Harry Potter: Wizards Unite (right) overworld in-game screenshot. All rights reserved by Niantic, Inc.*

## Recruitment

The study's ethics approval was obtained from the Macquarie University Human Research Ethics Committee for Medical Sciences (Reference No: 52019601512435. Project ID: 6015).

A mixed-methods survey was conducted online via convenience sampling over 2 weeks in February 2020. The survey was conducted via the Qualtrics platform and was distributed to 4 subreddit forums dedicated to PGO or HPWU, r/WizardsUnite, r/PokemonGO, r/harrypotterwu, and r/



TheSilphRoad. A recruitment post was written by the research team in each subreddit, and the moderators of each subreddit were contacted for the posts to be pinned to the top of the subreddit. The recruitment posts were pinned in all 4 subreddits for 2 weeks. Following the conclusion of data collection, data was downloaded from Qualtrics.

## Survey

---

This paper is a part of a larger study and consisted of 70 quantitative and qualitative questions. Players were eligible to play if they were over 18 years of age, played either PGO or HPWU for at least a week, and played the games in English (we wished to avoid misunderstandings of in-game terms in the survey). Information presented in this paper include general demographics information (age, gender, and country of residence) and self-identification ('hardcore', 'casual', 'something in between', or 'I have no idea' in terms of general playing style).

Quantitative results presented here included three questions. 1) "In a given week, how many days did you typically walk for 30 minutes or more prior to playing Pokemon GO or Wizards Unite?" with the options 0-7 and 'prefers not to say'. 2) "In a given week, how many days do you typically walk for 30 minutes or more now?" with the options 0-7 and 'prefers not to say'. 3) "Typically, how many hours a week do you / did you play Wizards Unite?" with the options being 'less than an hour', '1-5 hours', '6-10 hours', '11-15 hours', '16-19 hours', and '20 hours or more'. 4) "Typically, how many hours a week do you / did you play Pokemon GO?" with the same options as the previous question. We assessed the answers to these two questions as they outline any changes in exercise patterns after playing the games for all populations.

Qualitative results presented include results from two questions only, "Overall, do you prefer playing Pokemon GO or Wizards Unite? If you have a preference between the games, why do you prefer that game?" and "Which game got you to do more walking? Which game was more fun?". We assessed the answers to these questions because they revealed specific preferences and complaints players had with the two games, especially on how these factors affected their extent of outdoor exercise.

## Data analysis

---

Self-reported quantitative data was extracted from Qualtrics and directly imported into SPSS (version 25.0, IBM Corporation). Differences between self-identified player types were assessed using Pearson Chi-square analysis for both exercise and play duration per week for both games. This work was carried out by the researchers KI and LAE.

Qualitative responses were analysed through thematic analysis using NVivo v12 Plus (QSR International). The participant's game preference regarding fun and walking were extracted and the reasons provided by the participants towards their preference was coded inductively by the researchers KY, MDL, and JS. Codes were developed inductively according to the Braun and Clarke model of thematic analysis (Braun & Clarke, 2008). The entire research team was consulted throughout the qualitative analysis process to resolve disagreements until consensus was reached.

## RESULTS

---

### Demographics

---

The survey received valid answers from 1052 participants, with 762 (72%) having played PGO and 691 (66%) having played HPWU. General demographics data are presented in Table 1.

| Characteristic              | Number of participants |
|-----------------------------|------------------------|
| <b>Gender</b>               |                        |
| Male                        | 381 (36%)              |
| Female                      | 470 (45%)              |
| Other/unindicated           | 201 (19%)              |
| <b>Age</b>                  |                        |
| 18-25 years old             | 240 (23%)              |
| 26-35 years old             | 460 (44%)              |
| 36-45 years old             | 183 (17%)              |
| 46-55 years old             | 80 (8%)                |
| > 55 years old              | 43 (4%)                |
| Unindicated                 | 46 (4%)                |
| <b>Country of Residence</b> |                        |
| USA                         | 515                    |
| Europe                      | 292                    |
| Other Americas              | 87                     |
| Oceania                     | 62                     |
| Asia                        | 40                     |
| Middle East                 | 9                      |
| Africa                      | 3                      |
| Unindicated                 | 44                     |

*Table 1. Basic demographics data*

The largest group of players were those who self-identified as female casual players, taking up 64% of female participants and 35% of all participants. The second-largest group were male casual players (40% males, 18% all). The smallest group was male players who could not self-identify (3% males, 1% all), followed by female hardcore players (5% females, 3% all) (Table 2). Males are significantly more likely to play more seriously than females ( $p = 0.00$ ). Meanwhile, all age groups were represented in a similar manner across the player groups (Table 2).

Percentages are out of total numbers in a gender group (for the Gender column) or in an age bracket (for the Age group column).

| Self-identified player group | Gender |             | Age group   |             |
|------------------------------|--------|-------------|-------------|-------------|
| Hardcore                     | Male   | 69 (18.2%)  | 18-25 years | 30 (12.5%)  |
|                              | Female | 22 (4.7%)   | 26-35 years | 49 (10.7%)  |
|                              |        |             | 36-45 years | 17 (9.3%)   |
|                              |        |             | 46-55 years | 11 (13.8%)  |
|                              |        |             | > 55 years  | 5 (11.6%)   |
|                              |        |             |             |             |
| In-between                   | Male   | 148 (38.9%) | 18-25 years | 84 (35.0%)  |
|                              | Female | 101 (21.5%) | 26-35 years | 125 (27.4%) |
|                              |        |             | 36-45 years | 54 (29.5%)  |
|                              |        |             | 46-55 years | 21 (26.3%)  |
|                              |        |             | > 55 years  | 14 (32.6%)  |
|                              |        |             |             |             |
| Casual                       | Male   | 151 (39.7%) | 18-25 years | 118 (49.2%) |
|                              | Female | 299 (63.8%) | 26-35 years | 250 (54.3%) |
|                              |        |             | 36-45 years | 98 (53.6%)  |
|                              |        |             | 46-55 years | 41 (51.3%)  |
|                              |        |             | > 55 years  | 16 (37.2%)  |
|                              |        |             |             |             |
| No-identification            | Male   | 12 (3.2%)   | 18-25 years | 8 (3.3%)    |
|                              | Female | 47 (10.0%)  | 26-35 years | 35 (7.6%)   |
|                              |        |             | 36-45 years | 14 (7.7%)   |
|                              |        |             | 46-55 years | 7 (8.8%)    |
|                              |        |             | > 55 years  | 8 (18.6%)   |
|                              |        |             |             |             |

Table 2. Self-identification according to gender and age

### Exercise patterns between self-identified groups

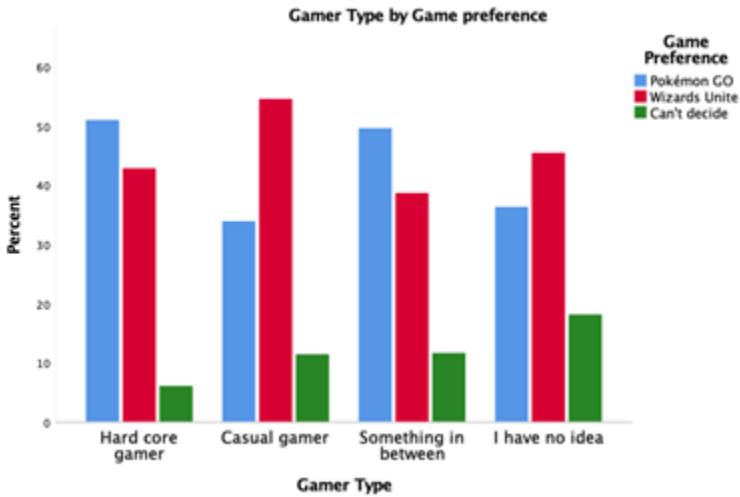
Participants across all player types had a significant increase in exercise frequency after starting to play PGO or HPWU, as suggested by paired sample t-tests. Participants were asked to indicate how many days they walked for at least 30 minutes in a typical week before and after they started playing. Hardcore players had significant changes in their exercise patterns ( $p = 0.00$ ), walking for 2.78 days a week on average ( $SD = 0.22$ )

prior to playing and 4.99 days (SD = 0.21) after starting to play. Casual players walked for 3.05 days a week (SD = 0.10) before playing and 4.58 days (SD = 0.09) after ( $p = 0.00$ ). The in-between group walked 3.21 days a week (SD = 0.14) before playing and 5.00 days (SD = 0.12) after ( $p = 0.00$ ), and the no-identification group walked 3.08 days a week (SD = 0.26) before playing and 4.80 days (SD = 0.25) after ( $p = 0.00$ ). Notably, the hardcore group had the lowest level of weekly exercise prior to playing PGO or HPWU, suggesting they had the most sedentary lifestyle out of all player group. (Table 3).

|  | Self-identified group | Mean (days per week) | Standard deviation |
|--|-----------------------|----------------------|--------------------|
| In a given week, how many days did you typically walk for 30 minutes or more prior to playing PGO or HPWU? | Hardcore              | 2.78                 | 0.22               |
|  | In-between            | 3.21                 | 0.14               |
|  | Casual                | 3.05                 | 0.10               |
|  | No identification     | 3.08                 | 0.26               |
| In a given week, how many days did you typically walk for 30 minutes or more now?                          | Hardcore              | 4.99                 | 0.21               |
|  | In-between            | 5.00                 | 0.12               |
|  | Casual                | 4.58                 | 0.09               |
|  | No identification     | 4.80                 | 0.25               |

*Table 3. Exercise patterns between the different self-identified groups*

Hardcore players are more likely to prefer PGO while casual players are more likely to prefer HPWU, with statistical significance ( $p = 0.03$ ) (Image 2).



*Image 2: Self-identified gamer type by game preference*

## Qualitative findings between self-identified groups

Self-identified groups had different preferences between PGO and HPWU, as well as with the different design features in the two games.

### *Design preferences of hardcore players*

The most predominant theme in the hardcore group was that they preferred to continue to receive profit for their efforts. This was highlighted with how PGO would give a miniscule profit for every repeated catch of a Pokémon one already owned (this new Pokémon can be turned into candy to increase the power of other Pokémons), but HPWU gave no rewards whatsoever for repeated catches of Foundables already in possession. Hardcore players found this design in HPWU to be particularly discouraging. Other main themes included liking deep games with talent (and thus gameplay) customisation. This was observed in HPWU, where one can put points into talent trees to specialise for a specific role in the team. Players felt this allowed for more strategic play. Players also liked PGO has a larger and more engaged community that allowed for better group play experience, but also noted PGO has a lot more 'cheaters'

(those who modified GPS data on their devices to deceive the game server into thinking they are physically travelling) than HPWU.

### *Design preferences of in-between players*

---

The themes in the in-between group have a marked shift from that of hardcore players. The most prevalent theme is that they prefer games with more content. This group of players liked whichever game that they felt 'had more to do'. Other main themes included liking games that had a better sense of achievement and purpose. Players stated walking with PGO had a better purpose as they could deliberately hunt certain Pokémons, and completing daily achievement was a better motivator. This group also reported PGO has a larger and more engaged community, and also noted they prefer a clear-defined objective seen in PGO, such as 'catch 3 Flying-type Pokémon'.

### *Design preferences for casual players*

---

Casual players demonstrated marked differences in motivation compared to the two previous groups. The greatest determinant to whether they play is their level of engagement with the original franchise the game is associated with. Overwhelmingly, casual players stated they prefer HPWU because they are already HPWU fans, with comments such as 'I grew up with Harry Potter' and 'I've been a fan since the first book'. They also stated they prefer to play games that rely on other people less, opting to prefer HPWU as the game does not encourage socialisation or interactivity, therefore allowing casual players to play at their own pace and convenience. The large variety of different objectives offered by HPWU was preferred by this group instead of the rigid, clear-defined PGO objectives, as the large variety of tasks allowed HPWU to constantly offer something new and the player would 'not get bored'. These factors may explain the large shift in quantitative preference data from PGO to HPWU in the casual player group.

There are still casual players who preferred PGO. Casual players preferring PGO liked games with an engaged community and liked to have

more content to play, echoing the preferences demonstrated by hardcore and in-between players.

### *Design preferences for no-identification players*

---

A very small section of our participants were no-identification players, and they demonstrated a preference profile similar to casual players. The most dominant theme was preferring HPWU due to already being a fan of the Harry Potter franchise, and that was motivation enough to keep playing.

### **Exercise patterns between PGO and HPWU for each self-identified group**

---

Players demonstrated different exercise patterns between PGO and HPWU. Specifically, players across all self-identified groups played more PGO than HPWU. This was especially highlighted in the hardcore group, where close to 35% of the PGO players indicated they played PGO for more than 20 hours every week, but only close to 15% of HPWU hardcore players indicated they played for this duration. More in-between and casual players for PGO also indicated they played for more than 20 hours every week, compared to their HPWU counterparts. The distribution of PGO players according to amount of time played per week tended to peak at higher values than with HPWU players. The only exception to this trend was with the casual group, where HPWU players tended to play more than the PGO group. Given our understanding from sections 3.2 and 3.3 that HPWU has a specific appeal for the casual group, it is possible that the factors previously covered are contributing to casual players playing more HPWU than other groups.



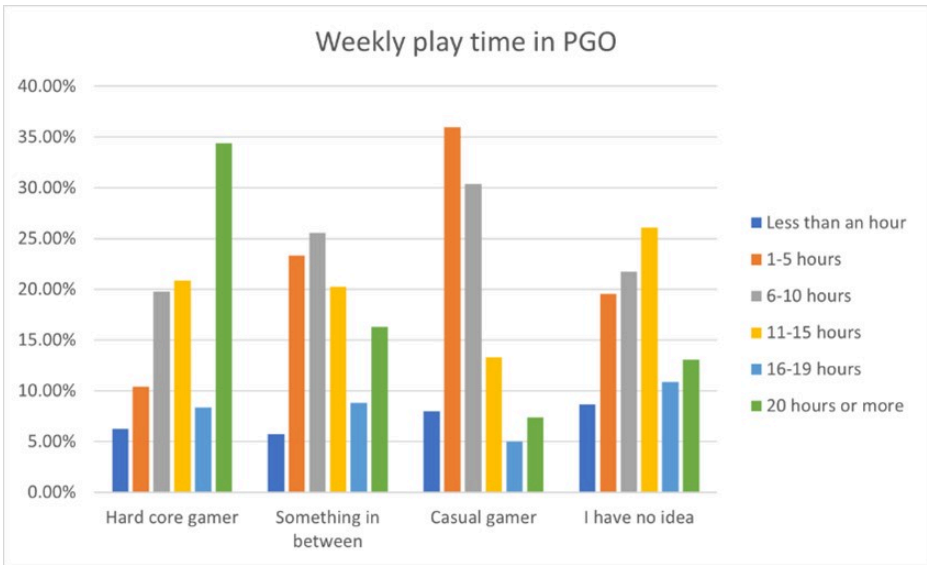


Image 3: Play time by player group in PGO

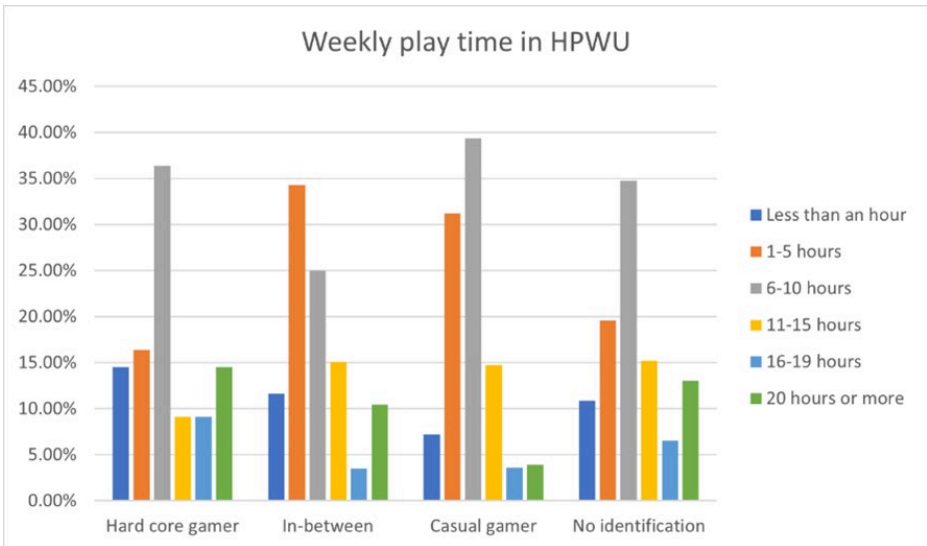


Image 4: Play time by player group in HPWU

## Qualitative findings between games

---

PGO and HPWU appear to affect exercise differently. Across our participants, 76% stated PGO was the game that caused them to exercise more, while only 55% chose PGO as the more fun game to play. This trend was observed across all player groups. We therefore conducted qualitative thematic analysis on free-text data entered by participants to understand why players were walking more with PGO, but a sizeable cohort also reported having more fun with HPWU despite walking less with the game.

### *More meaningful rewards for walking in Pokémon GO*

---

Participants indicated that clear, easy-to-understand, and useful goals were most beneficial for encouraging them to walk. PGO was noted for displaying exactly what the player was walking towards (i.e., a specific Pokémon) on the map, while HPWU only displayed the class of the Foundable. Participants therefore felt they were more likely to obtain a Foundable they had already collected in HPWU and were thus less incentivised to walk. Another design element is that walking a certain distance (e.g., 5 kilometres) in PGO allows one to hatch eggs into one Pokémon. However, walking for the same 5 kilometres in HPWU to unlock a Portkey only grants fragments of a Foundable. Participants therefore regarded unlocking one Portkey as less rewarding than hatching one PGO Eggs. Additionally, Pokeballs (items that PGO players require to catch Pokémon) can only be acquired via walking or from the cash shop, while Spell Energy (the HPWU resource players require to obtain Foundables) regenerates over time, providing players with much less pressure – and less reward – to walk.

### *Fun is increased by familiarity with the franchise and the availability of in-game activities*

---

Fun was associated with being more familiar with the original franchise and how much game content was available for the player. Both Pokémon and Harry Potter have a strong fanbase and participants from either fanbase tended to select the franchise they were more familiar with as

being 'more fun'. Those who exhausted available content in one game also considered the other game 'more fun', as there was 'just more to do' in the game they had not played thoroughly.

### *Immersive gameplay in Harry Potter: Wizards Unite reduced walking*

---

Gameplay in HPWU was highlighted as more difficult to play on a micro level, as tracing sigils on the phone required more finger dexterity and precision than throwing a ball to catch a Pokémon. Participants stated that HPWU was 'actually very very difficult to play while moving' and that they often had to stop walking to ensure gameplay accuracy. HPWU also encouraged immersive group battle at Fortresses, where each player in a team had a separate role (such as healing or dealing damage). While this was regarded as fun, participants noted once they entered a Fortress battle, they would be standing or sitting still for a long time.

### *Support technology for Pokémon GO enables more walking*

---

Both PGO and HPWU support 'Adventure Sync'(allowing steps walked to be tracked while the app is not open, with rewards provided to players when the app is next opened), however this feature was only recently implemented in HPWU at the time of the survey, with some players being unaware of it or having technical issues. PGO, by contrast, has supported Adventure Sync since November 2018. In addition, PGO also supports 'Go+' (an Apple Watch-style wrist apparatus that automatically collects resources and catches Pokémon as the player walks), allowing players to 'play the game without being aware of it'. This led participants to be more immersed in exercise and more freedom to incorporate the exercise into daily routine.

### *Social connections and support encourage more walking*

---

Lastly, participants reported social connections affected walking. Many participants walked to join group activities in locations because they wished to meet friends who would also be there, or they walked because others in their social circle 'were giving peer pressure' to walk more.

Participants also formed groups with their friends to walk together, making play, exercise, and social relationships one combined venture.

## DISCUSSION

---

### Are Hardcore Players More Sedentary?

---

To date, there has been little exploration of physical activity differences between hardcore and casual gamers (Bossler & Nakatsu, 2006; Goodman, McFerran, Purves, Redpath, & Beeken, 2018; Peng & Day, 2016). While media use in general has been identified as a primary contributing factor to sedentary behaviour (Peng & Day, 2016) and hardcore gamers have been thought to be at greater risk of health risks as they dedicate a large portion of their leisure time to gaming (Bossler & Nakatsu, 2006), only one study has sought to examine physical activity differences between hardcore and casual gamers (Ellis et al., 2020). In that study, which also involved players of augmented reality games, individuals who identified as hardcore gamers were more physically active, exercising for nearly 28 percent longer than those who identified as casual, with this increased physical activity being linked to increase play time (Ellis et al., 2020).

Our findings mirror those of this earlier study, finding that among active players of augmented reality games, those who identify as hardcore are significantly more physically active than those who identify as casual (exercising for at least 30 minutes a day for 4.99 days a week, as compared to 4.58 days), though we also find that prior to playing an augmented reality game, those that identify as hardcore had been significantly more sedentary than those identifying as casual. This finding is consistent with early studies on *Pokémon GO* (Marquet, Alberico, & Hipp, 2018; Wong, 2017), which found more sedentary individuals demonstrated the most significant increase in physical activity after beginning to play, compared to individuals who were already active, and suggests this increase may persist over time. These early studies offered little explanation as to the mechanism driving this, given that interventions aimed at increasing physical activity are typically more effective among populations already active (Wong, 2017). The results of

our study, with hardcore gamers being more sedentary prior to playing an augmented reality game yet experiencing the greatest increase in physical activity and having the highest amounts of engagement with the game, suggests that these differences may be explained by differing preferences by player type.

### Hardcore vs Casual Engagement Profiles in AR Games

---

Consistent with previous qualitative research into how enablers and constraints of AR play differed among player types (Smith et al., 2021), we found that different player types engaged with and prioritised different aspects of the game experience. In our study, hardcore players expressed a preference for in-game activities which maximised their reward/effort ratio, as well as gameplay elements which allowed for a degree of customisation. These players tended to invest their time in one or two well-optimised gameplay loops, caring more about depth than breadth of play. Hardcore players also indicated that they preferred games with larger and more engaged communities as it usually meant a smoother experience for group play and were uniquely disdainful of individuals who 'cheated.'

While in-between players also valued "rewarding" activities, their highest priority was experiencing a sense of achievement and purpose, either through setting in-game goals (with play allowing them to track this) or a game providing explicit, concrete goals for them to complete. This group also expressed a preference for games with a wide array of activities for them to spend their time on.

In contrast to the other groups, casual players did not seem to care about being rewarded, whether through in-game rewards or through a sense of achievement. Their priority was being able to play at their own pace and convenience, while not becoming bored and having an experience that engages with one of their existing fan identities.

These underlying differences in preferences between player types drive different playstyles, and likely account for intergroup differences in both play time and physical activity. This analysis presents a crucial step

towards understanding the heterogeneity of gamers and subsequently targeting interventions to different sub-populations.

### Exercise across different AR games

---

Despite having been created by the same company and utilising the same underlying augmented reality technology, our study found that the exercise and play patterns of players differed significantly between PGO and HPWU. Consistent with previous studies (Ellis et al., 2020; Laato, Hyrynsalmi, Rauti, Islam, & Laine, 2020; Marquet et al., 2018; Wong, 2017), which identified a positive correlation between play time and physical activity, we found that players in the hardcore and in-between groups played more PGO than HPWU and reported exercising more while playing PGO. Qualitative data suggesting that this was because they found the gameplay of PGO to be more rewarding. In contrast, though casual players played more HPWU than PGO, they noted that PGO was the game that made them walk more. This likely has to do with the games' different features, as a study amongst HPWU beta players indicated that ~58% of respondents walked at least twice as slowly when playing HPWU compared to their normal walking speed (Laato et al., 2020). We also found that, consistent with previous literature (Ryan et al., 2006), 'fun' was not necessarily aligned with engagement, as a sizeable cohort also reported having more fun with HPWU despite walking less with the game, and overall, a larger percentage (76%) reported that PGO made them exercise more, compared the amount that found it more fun (55%).

### Design differences

---

In our study, participants across all player groups suggested that PGO's design factors, such as incentivising physical activity and an interface optimised for mobile play, meant they were more inclined to walk when playing PGO compared to HPWU.

One prominent example is the experience of capturing Pokémon in PGO compared to collecting Foundables in HPWU. In PGO, one could see exactly what Pokémon one was heading towards on the overworld map, while in HPWU, one can only see the class of a given Foundable. This

distinction is crucial as there are no rewards given for collecting a duplicate Foundable in HPWU. This provides a level of appeal for all player types, as hardcore players can maximise their return on investment, in-between players can work towards their goals of catching certain Pokémon, and casual players can see a larger variety of Pokemon in the world, keeping the experience fresh.

Another design was the relative difficulty in conducting basic activities, given that tracing a sigil in HPWU was very difficult while moving. Moreover, whether one succeeded or failed in the sigil, one still consumed spell energy, a resource that did not naturally regenerate. This incentivised HPWU players to stop walking so they could make their spell "count." PGO players found it much easier to attempt to catch Pokemon while on the move, as all they needed to do was flick a Pokeball towards it with a finger. This incentivised them to continue to walk towards their next point of interest while playing. This level of difficulty also meant that HPWU was difficult to play with friends when one was not doing immersive group content, in contrast to PGO, which could be played casually while walking with friends.

Given the plethora of literature on how social support and peer groups engaging in behaviours together encourage continuance of said behaviour, as well as the need satisfaction literature (Ryan et al., 2006), one can see how PGO's relative simplicity leads to it being a better exergame, both in the short and long-term.

## Limitations

---

There are a few limitations to our study. Firstly, recruiting from Reddit indicates that the players are already invested in the games, and could be argued the group is more engaged than the average player and does not represent the entire population. However, this also meant the participants were very motivated to answer the survey and provided many in-depth responses for our qualitative questions.

Secondly, it is known that women are less likely than men to self-identify

as a game player, and even more so as a hardcore player, which may lead to errors in self-identification data.

Thirdly, the studies relied on self-reported exercise data and is open for recall bias. This aspect of the work could be improved through conducting prospective studies where we continuously monitor the exercise of new players of the two games over time.

## CONCLUSION

---

Our study suggests that AR games like PGO and HPWU indeed made an impact on the physical exercise level of players, and specific design criteria can make such games better equipped at targeting specific player populations. Factors such as ensuring hardcore players are rewarded for their continuous efforts could make such games more effective in specific populations, increasing efficacy for selective groups in the population.

## ACKNOWLEDGMENTS

---

We would like to acknowledge and thank the subreddit moderators for helping us with recruitment and their ongoing support with the project, as well as all the participants who answered the survey.

## REFERENCES

---

Ahn, M., Choe, S. P., Kwon, S., Park, B., Park, T., Cho, S., . . . Song, J. (2009). *Swan boat: pervasive social game to enhance treadmill running*. Paper presented at the Proceedings of the 17th ACM international conference on Multimedia (MM '09).

Althoff, T., White, R. W., & Horvitz, E. (2016). Influence of Pokémon GO on Physical Activity: Study and Implications. *Journal of Medical Internet Research*, 18(12), e315. doi:<https://doi.org/10.2196/jmir.6759>

Barkley, J. E., Lepp, A., & Glickman, E. L. (2017). "Pokémon GO!" May Promote Walking, Discourage Sedentary Behavior in College Students.



*Games for Health Journal*, 6(3), 165-170. doi:<http://doi.org/10.1089/g4h.2017.0009>

Bartle, R. (1996). Hearts, Clubs, Diamonds, Spades: Players Who Suit MUDS. <http://www.mud.co.uk/richard/hcdfs.htm>

Bogost, I. (2005). *The Rhetoric of Exergaming*. Paper presented at the Digital Arts and Cultures Conference, Copenhagen.

Bolton, J., Lambert, M., Lirette, D., & Unsworth, B. (2014). *PaperDude: a virtual reality cycling exergame*. Paper presented at the CHI '14 Extended Abstracts on Human Factors in Computing Systems (CHI EA'14).

Bonetti, A. J., Daniel G, D., Danoff, J. V., & Miller, T. A. (2010). Comparison of acute exercise responses between conventional video gaming and isometric resistance exergaming. *Journal of Strength and Conditioning Research*, 24(7), 1799-1803. doi:<https://doi.org/10.1519/jsc.0b013e3181bab4a8>

Bosser, A.-G., & Nakatsu, R. (2006). Hardcore gamers and casual gamers playing online together. In R. Harper, M. Rauterberg, & M. Combetto (Eds.), *Entertainment Computing - ICEC 2006*. Springer.

Boulos, M. N. K. (2012). Xbox 360 Kinect Exergames for Health. *Games for Health Journal*, 1(5), 326-330. doi:<https://doi.org/10.1089/g4h.2012.0041>

Braun, V., & Clarke, V. (2008). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. doi:<http://dx.doi.org/10.1191/1478088706qp063oa>

Chao, Y.-Y., Scherer, Y. K., Montgomery, C. A., Wu, Y.-W., & Lucke, K. T. (2015). Physical and Psychosocial Effects of Wii Fit Exergames use in Assisted Living Residents: A Pilot Study. *Clinical Nursing Research*, 24(6), 589-603. doi:<https://doi.org/10.1177/1054773814562880>

Clark, A. M., & Clark, M. T. G. (2016). Pokemon Go and Research: Qualitative, Mixed Methods Research, and the Supercomplexity of Interventions. *International Journal of Qualitative Methods*, 15(1). doi:<https://doi.org/10.1177/1609406916667765>

- Ellis, L. A., Lee, M. D., Ijaz, K., Smith, J., Braithwaite, J., & Yin, K. (2020). COVID-19 as 'Game Changer' for the Physical Activity and Mental Well-Being of Augmented Reality Game Players During the Pandemic: Mixed Methods Survey Study. *Journal of Medical Internet Research*, 22(12), e25117. doi:<http://www.jmir.org/2020/12/e25117/>
- Fogel, V. A., Miltenberger, R. G., Graves, R., & Koehler, S. (2013). The effects of exergaming on physical activity among inactive children in a physical education classroom. *Journal of Applied Behavior Analysis*, 43(4), 591-600. doi:<https://doi.org/10.1901/jaba.2010.43-591>
- Garde, A., Umedaly, A., Abulnaga, S. M., Junker, A., Chanoine, J. P., Johnson, M., . . . Dumont, G. A. (2016). Evaluation of a Novel Mobile Exergame in a A School-Based Environment. . *Cyberpsychology, Behavior, and Social Networking*, 19(3), 186-192. doi:<https://doi.org/10.1089/cyber.2015.0281>
- Goodman, W., McFerran, E., Purves, R., Redpath, I., & Beeken, R. J. (2018). The Untapped Potential of the Gaming Community: Narrative Review. *International Journal of Serious Games*, 6(3). doi:10.2196/10161
- Hruby, A., & Hu, F. B. (2014). The Epidemiology of Obesity: A Big Picture. *Pharmacoeconomics*, 33, 673-689. doi:<https://doi.org/10.1007/s40273-014-0243-x>
- Ip, B., & Jacobs, G. (2005). Segmentation of the games market using multivariate analysis. *Journal of Targeting, Measurement and Analysis for Marketing*, 13, 275-287. doi:<https://doi.org/10.1089/g4h.2012.0031>
- Jones, C. M., Scholes, L., Johnson, D., Katsikitis, M., & Carras, M. C. (2014). Gaming well: links between videogames and flourishing mental health. *Frontiers in Psychology*, 5(260). doi:<https://doi.org/10.3389/fpsyg.2014.00260>
- Kirman, B., & Lawson, S. (2009). Hardcore Classification: Identifying Play Styles in Social Games Using Network Analysis. In S. Natkin & J. Dupire (Eds.), *Entertainment Computing – ICEC 2009. Lecture Notes in Computer Science*. Springer.
- Laato, S., Hyrynsalmi, S., Rauti, S., Islam, A. K. M. N., & Laine, T. H. (2020).

Location-based Games as Exergames – From Pokémon To The Wizarding World. . *International Journal of Serious Games*, 7(1), 79-95.

doi:<http://dx.doi.org/10.17083/ijsg.v7i1.337>

Laine, T. H., & Suk, H. J. (2015). Designing Mobile Augmented Reality Exergames. *Games and Culture*, 11(5), 548-580. doi:<https://doi.org/10.1177/1555412015572006>

Maddison, R., Mhurchu, C. N., Jull, A., Jiang, Y., Prapavessis, H., & Rodgers, A. (2007). Energy expended playing video console games: an opportunity to increase children's physical activity? . *Pediatric Exercise Science*, 19(3), 334-343. doi:<https://doi.org/10.1123/pes.19.3.334>

Maloney, A. E., Bethea, T. C., Kelsey, K. S., Marks, J. T., Paez, S., Rosenberg, A. M., . . . Sikich, L. (2012). A Pilot of a Video Game (DDR) to Promote Physical Activity and Decrease Sedentary Screen Time. *Obesity*, 16(9), 2074-2080. doi:<https://doi.org/10.1038/oby.2008.295>

Manero, B., Torrente, J., Freire, M., & Fernández-Manjón, B. (2016). An instrument to build a gamer clustering framework according to gaming preferences and habits. *Computers in Human Behavior*, 62, 353-363. doi:<https://doi.org/10.1016/j.chb.2016.03.085>

Marquet, O., Alberico, C., & Hipp, A. J. (2018). Pokémon GO and physical activity among college students. A study using Ecological Momentary Assessment. *Computers in Human Behavior*, 81. doi:<https://doi.org/10.1016/j.chb.2017.12.028>

Peng, W., Crouse, J. C., & Lin, J.-H. (2013). Using Active Video Games for Physical Activity Promotion: A Systematic Review of the Current State of Research. *Health Education & Behavior*, 40(2), 171-192. doi:<https://doi.org/10.1177/1090198112444956>

Peng, W., & Day, T. (2016). Media Use and Physical Fitness In L. Reinecke & M. B. Oliver (Eds.), *The Routledge Handbook of Media Use and Well-Being, International Perspectives on Theory and Research on Positive Media Effects*. Routledge.

Penko, A. A. L., & Barkley, J. E. (2010). Motivation and physiologic

responses of playing a physically interactive video game relative to a sedentary alternative in children. *Annals of Behavioral Medicine*, 39(2), 162-169. doi:<https://doi.org/10.1007/s12160-010-9164-x>

Rahmani, E., & Boren, S. A. (2012). Videogames and Health Improvement: A Literature Review of Randomized Controlled Trials. *Games for Health Journal*, 1(5), 331-341. doi:<https://doi.org/10.1089/g4h.2012.0031>

Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The Motivational Pull of Video Games: A Self-Determination Theory Approach. *Motivation and Emotion*, 30, 344-360. doi:<https://doi.org/10.1007/s11031-006-9051-8>

Şimşek, T. T., & Çekok, K. (2016). The effects of Nintendo Wii(TM)-based balance and upper extremity training on activities of daily living and quality of life in patients with sub-acute stroke: a randomized controlled study. *International Journal of Neuroscience*, 126(12), 1061-1070. doi:<https://doi.org/10.3109/00207454.2015.1115993>

Smith, J., Lee, M. D., Ellis, L. A., Ijaz, K., & Yin, K. (2021). Developing a novel psychographic-behavioral qualitative mapping method for exergames. . *International Journal of Serious Games*, 8(2). doi:<https://doi.org/10.17083/ijsg.v8i2.422>

Tuunanen, J., & Hamari, J. (2012). *Meta-synthesis of player typologies*. Paper presented at the Proceedings of Nordic Digra 2012 Conference: Games in Culture and Society, Tampere, Finland.

Warburton, D. E. R., Bredin, S. S. D., Horita, L. T. L., Zbogar, D., Scott, J. M., Esch, B. T. A., & Rhodes, R. E. (2007). The health benefits of interactive video game exercise. *Applied Physiology, Nutrition, and Metabolism*, 32(4), 665-663. doi:<https://doi.org/10.1139/H07-038>

Witkowski, E. (2013). *Running from zombies*. Paper presented at the Proceedings of The 9th Australasian Conference on Interactive Entertainment: Matters of Life and Death (IE '13).

Wong, F. Y. (2017). Influence of Pokémon Go on physical activity levels of university players: a cross-sectional study. *International Journal of Health Geographics*, 16(6). doi:<https://doi.org/10.1186/s12942-017-0080-1>



# *Making videogames more inclusive for people living with MND: protocol for a scoping review*

BEN O'MARA, MATTHEW HARRISON, NATASHA DWYER & KIRSTEN HARLEY

## ABSTRACT

---

People living with motor neurone disease (MND) in Australia experience increasing physical disability, often accompanied by a lack of choice and control in daily activities, isolation, boredom, stress and similar mental health issues that are all associated with a reduced quality of life. Yet, people living with MND also face major technological, social and economic barriers to participating in recreational activities and online environments that can help with overall wellbeing, including playing videogames, a past time growing in popularity. The aim of this protocol is to clearly articulate and document the objectives, methods, and reporting of a scoping review that maps the evidence base of what helps make videogames more inclusive for people living with MND. We developed the protocol as the first stage of our research. The protocol describes a framework for guiding the research, including how the academic and grey literature databases will be systematically searched, the ways in which studies are to be assessed for inclusion and their data summarised, and the overall review's findings reported. The protocol, and findings of the review, are expected to help guide future research into establishing what may or may not work best

when developing more inclusive videogames for people living with MND, and how research may inform policy development, clinical practice, technological work and awareness raising activities. Sharing the protocol at this stage also offers an opportunity for other researchers and practitioners to provide feedback on our decision-making process, learn from our work and use the protocol as a basis for their own scoping reviews to help reduce barriers to videogames for those experiencing health, social, education, economic and similar issues. We presented significant parts of this protocol at the Games for Change Asia-Pacific 2021 conference.

## INTRODUCTION

---

Motor neurone disease (MND) is a neurodegenerative condition in which the muscles enabling movement, speech, swallowing and breathing progressively weaken and waste, causing increasing physical disability and with typical life expectancy of two to three years (Dharmadasa et al., 2017). In Australia, people living with MND face major challenges to accessing and using the internet, smartphones and other information technology for playing videogames and enjoying similar recreational activities (Mackenzie et al., 2016). For those people living with MND who may enjoy videogames, the challenges can reduce quality of life.

A lack of physical ability and technological, economic and social barriers can all lead to difficulty with independent operation of videogame technology and enjoying playing them alone and with others. Limitations in hand function make it hard to press buttons on keyboards, a mouse and other controllers, while compromised speech affects capacity to use microphones and engage with voice activated software (Mackenzie et al., 2016) (James et al., 2019). There is a need for training and support to use technology, software, hardware and/or assistive technology and equipment (Mackenzie et al., 2016) (Hobson et al., 2017). Cost is an issue, with apps being reported as expensive, as are a lack of interest and low levels of computer literacy and confidence for some people living with MND (Mackenzie et al., 2016) (Hobson et al., 2017). Internet speeds may be slow and related technical problems can limit access to videogames, too (Helleman et al., 2020).

Limited access to and difficulty playing videogames, like a lack of access to online information, can reinforce the exclusion felt by some people living with MND. In turn, exclusion from information technology can reduce a sense of choice and control, which has been found to be important when living with MND. Supporting choice and control with MND can help to facilitate better care and reduce stress by better meeting a person's needs, shared decision making and improved communication (Maunsell et al., 2019). Simply having an opportunity to enjoy the fun and pleasure of hobbies like playing videogames has also been found to be important for reducing the worry of what lies ahead when living with a terminal illness, and for creating memories and spending quality time with family and loved ones (MND Australia, 2021).

This protocol paper seeks to describe the process and methods we are using to conduct a scoping review for mapping relevant areas of research into what may or may not work best when making videogames more inclusive for people living with MND. Our description includes the framework used to conduct the scoping review, including its major stages and activities, major research questions, databases to be searched, how studies will be included or excluded and how we will present the findings of our scoping review. In line with previous research recommendations, the development of this scoping review protocol can also help to support the implementation of a scoping review. We argue that protocol papers are able to clearly define the objectives, methods, and reporting of the review, and encourage transparency of the process and ways to reduce bias (Tricco et al., 2016). In turn, with a transparent and well developed process, it is possible to conduct a higher quality scoping review that better explains the areas of research that may or may not work best for making videogames more inclusive for people living with MND. We also hope this paper helps to build a community of practice with other researchers and practitioners and for providing an opportunity to discuss our decision-making process and improve our approach, as well providing an example for others to use in scoping reviews about videogames.

## BACKGROUND

---

Videogames for people living with MND, like other forms of technology,



are a part of daily life, and an opportunity for enjoyment and connection with others (Harley & Willis, 2020). Recent survey work conducted by the MND Association of Victoria in Australia with people living with MND found that while connecting with family and friends online was the most common reason for using iPads, playing videogames was also a common reason (McEvoy et al., 2020). Similarly, other people living with MND report using technology such as NeuroNode (Harley, 2019) to play videogames or the potential of eye gaze tracking for helping with their technology needs (Microsoft, 2019) (Connors et al., 2019), and people living with MND, family, friends and loved ones play videogames competitively to help raise funds for MND (MND Association of England, Wales and Northern Ireland, 2021).

Evidence suggests that making videogames more inclusive for people living with MND could help to reduce stress, and improve quality of life and social connection. Yet, making videogames more inclusive for MND it is a complex and challenging area of work. Past research, while quite limited in scope and applicability to the Australian context, suggests that there is great potential to find ways of develop videogames and related information technology so that they are easier to interact with and enjoy for people living with MND. Changes to information about decision making on online platforms, software and algorithms, virtual reality systems, touch screens, motion capture and feedback devices, voice recognition, controllers and peripherals, wheelchairs and similar equipment used for accessing videogames, wireless internet connections, and other forms of technological modification and re-design can encourage choice and participation, and reduce the burden and limitations of physical disability from muscle weakness (Maunsell et al., 2019) (Marston & Smith, 2012) (Hobson et al., 2018) (Pinto et al., 2020).

For example, re-designing touch-screen layouts has been found to help reduce the amount of hand movement required for interaction by people living with MND, reducing time taken and enabling participation despite moderate arm weakness or fatigue (Hobson et al., 2018). Voice recognition and eye gaze software have also been reported as helping to overcome arm weakness for those with MND (Hobson et al., 2017) (Trevizan et al., 2018). Significantly, involving people living with MND in both the design and development of information technology used by videogames, and in the

selection of information technology that best suits their needs, can better support them to improve and maintain functionality (Pousada García et al., 2021). More broadly, improvements in mood and wellbeing are also possible when playing videogames (Weber et al., 2009) (Soundy & Condon, 2015) (Belchior et al., 2019) (Villani et al., 2018).

However, the research has also found significant challenges in developing videogames and associated information technology to meet the needs of people living with MND and experiencing physical disability. Health professionals need to have the appropriate knowledge about use of information technology to support people with MND to select the best technology options as early as possible after diagnosis (Mackenzie et al., 2016). A lack of confidence, skills and understanding in how to use information technology, and upper limb dysfunction, continue to make it hard for people living with MND to easily enjoy online platforms (Mackenzie et al., 2016) (Hobson et al., 2017). Language and cognitive difficulties, such as difficulties with reading and concentration, have prevented some people with MND from learning to use new devices (Hobson et al., 2017). Slow internet connections and technical issues have limited participation (Helleman et al., 2020). The need for “multiple changes” in the design of a digital product like a videogame is also a major issue. Time pressures, financial constraints and rapid advances in technology development, combined with the involvement of users at each stage of the process, can make it much harder to implement changes to code and other aspects of a product (Hobson et al., 2018).

Structural barriers also play a major role in limiting how people living with MND access information technology used for videogames. More training and support programs are required to increase ability and confidence in using information technology for a range of needs, including recreation (Mackenzie et al., 2016) (Hobson et al., 2017). The cost of the internet and specific forms of information technology, such as new and emerging kinds like eye tracking and brain-computer interfaces, is too high for some people living with MND (Mackenzie et al., 2016) (Helleman et al., 2020). Poor or unstable access to the physical infrastructure that provides high quality broadband internet, including the National Broadband Network and fiber optic cabling, can interrupt and stop the playing of software

like videogames online (Jang-Jaccard et al., 2014). Health professionals also need to have an in depth understanding of how to best support people living with MND to use information technology in ways that suit their needs (Mackenzie et al., 2016).

Furthermore, there is a major gap in research about MND and videogames. No in-depth study exists in Australia that explores the opportunities and challenges in developing more inclusive videogames for people living with MND. Beyond Australia, groups of researchers have begun piloting work exploring the potential of videogames for people living with MND and others experiencing disability, such as researchers associated with Microsoft's game accessibility program and X-Box Adaptive Controller (Sanchez, 2021). Yet, these studies are limited in applicability due to their relatively small size, and lack of particular focus on the experiences of people living with MND.

There is a small evidence base in Australia and some relevant studies internationally that have helped to establish what may or may not support people living with MND to better use information technology in a general sense, which, while important, do not directly address experiences with videogames. MND Victoria's recent survey does find that videogames are a common reason for using an iPad by people living with MND (McEvoy et al., 2020), but it does not explore what may or may not help in their access and use. Similarly, other studies about developing more inclusive approaches to use of information technology for videogames and other platforms with people experiencing physical and other forms of disability show relevance to MND, but are not focused on the experiences of those with MND. Currently, the limitations of the evidence base suggest a need for, and valuable opportunity to, scope and bring together existing studies to better determine what areas of future research could best support the needs of people living with MND.

A scoping review can help to address issues with the evidence base, and map studies of what may help make videogames more inclusive for people living with MND. The mapping provides an "overview" of past research conducted on a topic and identifies the range of available studies, summarizes results of studies and highlights evidence gaps (Wickremasinghe et al., 2016) (Pollock et al., 2021). Scoping reviews are an

established approach to mapping existing research for helping to manage the physical symptoms and psychological conditions associated with MND (Waito et al., 2017) (Zarotti et al., 2021). Scoping reviews have also helped to identify areas for future research into videogames and physical health (Baranowski & Lyons, 2020), and health and information technology generally (Pradhan et al., 2019).

There are two major ways in which a scoping review is valuable for providing an overview of research into videogames and MND. In the first instance, a scoping review can help to widen understanding of the research available in order to develop a comprehensive approach, particularly when it is difficult to imagine the range of studies available (Arksey & O'Malley, 2005). While scoping reviews do not aim to critically assess individual studies (Arksey & O'Malley, 2005), a comprehensive approach to gathering existing evidence is particularly relevant to this study given the intersection of relevant fields, including health, disability, technology and education.

In the second instance, scoping reviews can help to balance the academic literature and more effectively map the evidence by identifying relevant work in grey literature outside the academy (Douma et al., 2020), such as evaluations and other studies in government, non-profit, technology development and commercial databases. The lack of published academic literature on videogames and MND suggests exploring grey literature is important for maintaining a comprehensive approach.

To help address the need to better understand what research is most relevant for developing videogames that are more inclusive for people living with MND, in this scoping review protocol we present an approach based on Arksey and O'Malley's framework for conducting a scoping review (Arksey & O'Malley, 2005) and recent updates to the framework to help improve methodological clarity (Levac et al., 2010) (Joanna Briggs Institute, 2015) (Pollock et al., 2021). The framework provides the stages required for organising and conducting the review.

## METHODS AND ANALYSIS

---

Building on past research into the effectiveness of scoping reviews, this

scoping review will be conducted in five main stages (Arksey & O'Malley, 2005) (Pollock et al., 2021):

- Stage 1. Identifying the research question
- Stage 2. Identifying relevant studies
- Stage 3. Study selection.
- Stage 4. Chart, present and/or narratively summarize the data.
- Stage 5. Collating, summarizing and reporting the results.

A limited consultation was undertaken with a small number of relevant key stakeholders, including a librarian, videogame researchers and practitioners, a person living with MND and health and non-profit workers with a background in MND. Stakeholder consultation is an optional part of a scoping review (Arksey & O'Malley, 2005). The consultation for this review helped to identify appropriate ways to practically manage the project, relevant databases and areas relevant to research questions and fields of study. However, while a more robust stakeholder consultation may be beneficial, due to financial and time restraints, the scoping review will not include further stakeholder engagement.

The research team formed during the consultation. Comprising of four researchers, the team bring together expertise in health communication and information technology, health sociology and history of sociology, videogame development and games-based learning, and user experience (UX) design and digital trust. All the team have worked on projects that have explored, or were highly relevant to, barriers and opportunities in the access and use of online platforms. One researcher was diagnosed with MND in 2013 and continues to write and publish academically about lived experience of the disease.

## STAGE 1. IDENTIFYING THE RESEARCH QUESTION

---

This protocol and the initial development of the scoping review were based on an exploration of relevant studies in MND and videogame research. The exploration resulted in a decision to use search criteria that included the lived experience of MND wherever possible, including from grey literature,

as evidence suggests that user participation is an important part of health, MND and technology research (Maunsell et al., 2019) (Hobson et al., 2018) (Darcy et al., 2017) (Ghanouni et al., 2020).

The exploration of relevant studies identified the following research questions for the scoping review:

- What is the existing evidence base about use of video games by people with MND, and opportunities for and barriers to making them more inclusive?
- What kinds of software, hardware aids and assistive technology are available to enable people living with MND to play video games?
- What are the barriers and opportunities for improving use of videogames for people living with MND?
- What role do videogames play for people living with MND and what adjustments can people living with MND make to enable game playing?
- How can future research address the evidence base, including for exploring barriers and opportunities, policy development, advocacy, education, and awareness raising activities, clinical practice and games technology development?

## STAGE 2. IDENTIFYING RELEVANT STUDIES

---

The second stage of the scoping review focused on developing search criteria for identifying studies to be included in the review, using recommendations from Arksey and O'Malley (Arksey & O'Malley, 2005) and Pollock et. al (Pollock et al., 2021). Development of the criteria aimed to reinforce a comprehensive approach and yet also direct the search to the most relevant studies and research.

The scoping review will include studies that can be found in the following databases:

- MEDLINE/ PubMed, Cochrane Library, Scopus, SocIndex, Web of

Science, Google Scholar, Joanna Briggs Library, ACM Digital Library, Sports Medicine & Education Index, Humanities Index, Computer Science Database.

A full list of databases is available in the Supplemental Materials. Studies will also be included from the following “grey literature” databases:

- MND Associations of Australia: MND New South Wales, MND Victoria, MND Queensland, MND Tasmania, MND Western Australia, MND South Australia
- Australian Federal Government: Department of Health; Department of Infrastructure, Transport, Regional Development and Communications; Australian Communication and Media Authority; National Disability Insurance Scheme; Department of Social Services
- Australian State and Territory Governments
- Peak bodies: Home Modifications Australia, Assistive Technology Australia, Cerebral Palsy Australia, Neurological Alliance Australia, Muscular Dystrophy Australia, Media Access Australia, Infoxchange, eSafety Commissioner, Occupational Therapy Australia, Speech Pathology Australia, Australian Centre for the Moving Image, Australian Communications Consumer Action Network, Australian, Interactive Games and Entertainment Association of Australia
- International: International Alliance of ALS/MND, MND Association (England, Wales and Northern Ireland), ALS Association, ALS Society of Canada, World Wide Web Consortium (W3C), Microsoft, Apple, Google, International Game Developers Association

Based on the exploration of relevant studies, we agreed on the following eligibility criteria:

- Type of publication: journal articles and conference presentations
- Time frame: any
- Language: English

- Study population: people living with or affected by MND, including family, carers, MND Association staff and health, technology and disability professionals.
- Types of interventions: studies aiming at increasing use and access of information technology for playing videogames by people living with MND.
- Types of articles: quantitative (e.g. surveys); qualitative (e.g. semi-structured interviews); prototype development; iterative, user-centered digital technology development; pilots; rapid, narrative, systematic and other reviews; evaluation reports.

After initial scoping of the evidence base, we agreed to exclude studies that were: conference abstracts; book reviews; and, not published in English.

We used an iterative process to develop search terms for the scoping review, in line with past recommendations (Arksey & O'Malley, 2005) (Levac, Colquhoun, & O'Brien, 2010) (Pollock et al., 2021). The following keywords are to be used:

- “motor neurone disease” OR “motor neuron disease” OR “amyotrophic lateral sclerosis” OR “frontotemporal degeneration” OR “nervous system diseases” OR “muscular atrophy” OR “muscle wasting” OR “muscular dystrophy” OR “hand weakness” OR paralysis OR palsy OR (“fine motor” AND (weak\* OR degenerat\* OR regres\*))
- “educational technology” OR console\* OR (hand\* N/5 device\*) OR “technology uses in education” OR (comput\* N/5 mice) OR joystick\* OR (point\* N/5 device\*) OR “virtual reality” OR “machine learning”)
- esport\* OR e-sport\* OR “electronic sport” OR gaming OR gamification OR video-gam\* OR videogam\*
- inclusion OR inclusive OR adjust\* OR accommodation OR intervention OR adapt\* OR support\* OR responsive\* OR management
- “videogames” OR “online games” OR “internet games” OR “mobile



games" OR "computer games" OR "gaming" OR gaming OR gamification OR video-gam\* OR videogam\* OR "online game" OR "internet game OR "mobile game" OR "computer game"

- "information technology" OR "internet" OR "computer" OR "mobile" OR "technology" OR "assistive technology" OR "communication" OR "aids" OR "equipment" OR "phone" OR "tablet" OR "device" OR "screen" OR "smart phone" OR smartphone\* OR tablet\* OR ipad\*

Articles are to be retrieved and then screened for their titles, abstracts and index terms. An academic librarian was consulted to help enhance medical and other search terms, and ways to improve searching of academic and grey literature databases (Supplemental Information). Once retrieved, articles from each database will be imported into Zotero reference management software.

### STAGE 3: STUDY SELECTION

---

In the third stage of our scoping review, we will identify studies to be included in the review. The results from searches of all databases will be consolidated and all duplicates removed. Following consolidation, one team member will screen titles and abstracts of the articles to exclude those that do not meet the review's eligibility criteria. Studies meeting eligibility criteria will be retrieved.

Another team member will conduct a screening on a sample of retrieved articles. The screening will help to maintain consistency with regards to application of review eligibility criteria. As part of the screening, studies that remain unclear as to whether they are eligible for inclusion will be reviewed. Team member disagreements about study eligibility of the sampled articles will be discussed by the two reviewers until there is agreement. A third reviewer will arbitrate, if required. We will report on study selection using the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) (Tricco et al., 2016).

## STAGE 4: CHART, PRESENT AND/OR NARRATIVELY SUMMARIZE THE DATA.

---

A data extraction framework was developed using past recommendations for the conduct of scoping reviews and our exploration of relevant studies (Hobson et al., 2017) (Pollock et al., 2021). The framework includes 12 categories (Table 1). Categories will be used to assess articles included in the scoping review. Piloting of data extraction will be performed with 2 reviewers on 2 to 3 studies to help with consistency and to identify any need for adjustments.

In addition to standard article information, the framework will extract information about kinds of technology used to improve use and access by people living with MND, as well as barriers to technology and the types of contexts, methods, concepts and key findings explored by researchers.

The framework will be piloted by two team members. The pilot will be performed on a sample of included studies to help make sure that coding of the framework is consistent. The framework categories will be revised where required and disagreements addressed through team member discussions.

The two team members will also use the framework to independently chart the data from each study included in the review. Afterwards, a sample of the articles independently reviewed will be compared by the two team members. Issues or a lack of compatibility between data extractions will be discussed and resolved, and where required, a third team member will arbitrate.

| Article title | Authors | Journal | Publication Date | Population | Kinds of technology | Context | Concept | Method | Outcomes | Barriers and opportunities | Key findings |
|---------------|---------|---------|------------------|------------|---------------------|---------|---------|--------|----------|----------------------------|--------------|
|---------------|---------|---------|------------------|------------|---------------------|---------|---------|--------|----------|----------------------------|--------------|

*Table 1: Data Extraction Framework*

## STAGE 5: COLLATING, SUMMARISING AND REPORTING THE RESULTS

---

The analysis of the data will provide information on the existing evidence

base about use of video games by people with MND, and opportunities for and barriers to making them more inclusive. We anticipate that the evidence base will show what areas of future research are likely to help determine what may or may not work best when developing more inclusive videogames for MND. We also hope that it will be possible to highlight the ways in which research can contribute to policy development, clinical practice, awareness raising and related initiatives. Results will be presented as a whole and in visual form (e.g. tables, graphs), where required.

## ETHICS AND DISSEMINATION

---

This study is being completed in line with university ethics protocols and processes, and therefore does not require an ethics application for approval. The article and its results will be disseminated via submissions to academic journals and presentations at relevant conferences and events, including those held by the MND Network in Australia. We hope to complete knowledge translation based on the article findings, including written and spoken appearances in media outlets. We also plan to share findings from this article in meetings and workshops involving health professionals, people living with MND and others supporting those living with MND to encourage evidence-based planning, evaluation, funding submissions and related activities.

## ACKNOWLEDGEMENTS

---

This research was made possible by: an Adjunct Research Fellow position at the Department of Media and Communication, Faculty of Health, Arts and Design, Swinburne University; support and advice from MND Australia, University of Melbourne and Victoria University; and carer, family and related support for managing with MND while conducting research, including the use of video conferencing technology and email communication.

## REFERENCES

---

Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological

framework. *International Journal of Social Research Methodology*, 8(1), 19–32. <https://doi.org/10.1080/1364557032000119616>

Baranowski, T., & Lyons, E. J. (2020). Scoping Review of Pokémon Go: Comprehensive Assessment of Augmented Reality for Physical Activity Change. *Games for Health Journal*, 9(2), 71–84. <https://doi.org/10.1089/g4h.2019.0034>

Belchior, P., Yam, A., Thomas, K. R., Bavelier, D., Ball, K. K., Mann, W. C., & Marsiske, M. (2019). Computer and Videogame Interventions for Older Adults' Cognitive and Everyday Functioning. *Games for Health Journal*, 8(2), 129–143. <https://doi.org/10.1089/g4h.2017.0092>

Connors, K., Mahony, L., & Morgan, P. (2019). Variation in assistive technology use in Motor Neuron Disease according to clinical phenotypes and ALS Functional Rating Scale—Revised Score: A prospective observational study. *NeuroRehabilitation*, 44(2), 303–313. <https://doi.org/10.3233/NRE-182511>

Darcy, S., Green, J., & Maxwell, H. (2017). I've got a mobile phone too! Hard and soft assistive technology customization and supportive call centres for people with disability. *Disability and Rehabilitation. Assistive Technology*, 12(4), 341–351. <https://doi.org/10.3109/17483107.2016.1167260>

Dharmadasa, T., Henderson, R. D., Talman, P. S., Macdonell, R. A., Mathers, S., Schultz, D. W., Needham, M., Zoing, M., Vucic, S., & Kiernan, M. C. (2017). Motor neurone disease: Progress and challenges. *The Medical Journal of Australia*, 206(8), 357–362. <https://doi.org/10.5694/mja16.01063>

Douma, M. J., MacKenzie, E., Loch, T., Tan, M. C., Anderson, D., Picard, C., Milovanovic, L., O'Dochartaigh, D., & Brindley, P. G. (2020). Prone cardiopulmonary resuscitation: A scoping and expanded grey literature review for the COVID-19 pandemic. *Resuscitation*, 155, 103–111. <https://doi.org/10.1016/j.resuscitation.2020.07.010>

Ghanouni, P., Jarus, T., Zwicker, J. G., Lucyshyn, J., Fenn, B., & Stokley, E. (2020). Design Elements During Development of Videogame Programs for Children with Autism Spectrum Disorder: Stakeholders' Viewpoints. *Games for Health Journal*, 9(2), 137–145. <https://doi.org/10.1089/g4h.2019.0070>

- Harley, K. (2019). *Communication*. Kirsten Harley: Living With MND. <https://kirstenharleymnd.home.blog/2019/11/22/communication/>
- Harley, K., & Willis, K. (2020). Living with motor neurone disease: An insider's sociological perspective. *Health Sociology Review: The Journal of the Health Section of the Australian Sociological Association*, 29(2), 211–225. <https://doi.org/10.1080/14461242.2020.1789487>
- Helleman, J., Kruitwagen, E. T., van den Berg, L. H., Visser-Meily, J. M. A., & Beelen, A. (2020). The current use of telehealth in ALS care and the barriers to and facilitators of implementation: A systematic review. *Amyotrophic Lateral Sclerosis & Frontotemporal Degeneration*, 21(3–4), 167–182. <https://doi.org/10.1080/21678421.2019.1706581>
- Hobson, E. V., Baird, W. O., Partridge, R., Cooper, C. L., Mawson, S., Quinn, A., Shaw, P. J., Walsh, T., Wolstenholme, D., & McDermott, C. J. (2018). The TiM system: Developing a novel telehealth service to improve access to specialist care in motor neurone disease using user-centered design. *Amyotrophic Lateral Sclerosis & Frontotemporal Degeneration*, 19(5–6), 351–361. <https://doi.org/10.1080/21678421.2018.1440408>
- Hobson, E. V., Fazal, S., Shaw, P. J., & McDermott, C. J. (2017). "Anything that makes life's journey better." Exploring the use of digital technology by people living with motor neurone disease. *Amyotrophic Lateral Sclerosis & Frontotemporal Degeneration*, 18(5–6), 378–387. <https://doi.org/10.1080/21678421.2017.1288253>
- James, N., Power, E., Hogden, A., & Vucic, S. (2019). Patients' perspectives of multidisciplinary home-based e-Health service delivery for motor neurone disease. *Disability and Rehabilitation. Assistive Technology*, 14(7), 737–743. <https://doi.org/10.1080/17483107.2018.1499139>
- Jang-Jaccard, J., Nepal, S., Alem, L., & Li, J. (2014). Barriers for delivering telehealth in rural australia: A review based on Australian trials and studies. *Telemedicine Journal and E-Health: The Official Journal of the American Telemedicine Association*, 20(5), 496–504. <https://doi.org/10.1089/tmj.2013.0189>

Joanna Briggs Institute. (2015). *The Joanna Briggs Institute Reviewers' manual 2015—Methodology for JBI scoping reviews*.

Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: Advancing the methodology. *Implementation Science: IS*, 5, 69. <https://doi.org/10.1186/1748-5908-5-69>

Mackenzie, L., Bhuta, P., Rusten, K., Devine, J., Love, A., & Waterson, P. (2016). Communications Technology and Motor Neuron Disease: An Australian Survey of People With Motor Neuron Disease. *JMIR Rehabilitation and Assistive Technologies*, 3(1), e2–e2. PubMed. <https://doi.org/10.2196/rehab.4017>

Marston, H. R., & Smith, S. T. (2012). Interactive Videogame Technologies to Support Independence in the Elderly: A Narrative Review. *Games for Health Journal*, 1(2), 139–152. <https://doi.org/10.1089/g4h.2011.0008>

Maunsell, R., Bloomfield, S., Erridge, C., Foster, C., Hardcastle, M., Hogden, A., Kidd, A., Lisiecka, D., McDermott, C. J., Morrison, K., Recio-Saucedo, A., Rickenbach, L., White, S., Williams, P., & Wheelwright, S. J. (2019). Developing a web-based patient decision aid for gastrostomy in motor neuron disease: A study protocol. *BMJ Open*, 9(12), e032364. <https://doi.org/10.1136/bmjopen-2019-032364>

McEvoy, R., Olive, D., & Gomizel, K. (2020, November). *Why is Your iPad sitting Unused in the Corner? Collaborative iPad Review*. Allied Professionals Forum, Virtual. <https://vimeo.com/522541364>

Microsoft. (2019). *Finding independence in the blink of an eye*. Microsoft. <https://inculture.microsoft.com/social-good/inclusion/steve-gleason-als/>

MND Association of England, Wales and Northern Ireland. (2021). *#GameOverMND*. <https://www.mndassociation.org/get-involved/fundraising/fundraising-events/game-over-mnd/>

MND Australia. (2021). *End of life care: A guide for people living with MND*. MND Australia Inc. [https://www.mndaustralia.org.au/getmedia/eeaabc08-8c23-41ca-bae9-1e4927a757f3/MNDAus\\_EndofLifeGuide\\_digital-version.pdf](https://www.mndaustralia.org.au/getmedia/eeaabc08-8c23-41ca-bae9-1e4927a757f3/MNDAus_EndofLifeGuide_digital-version.pdf)

Pinto, S., Quintarelli, S., & Silani, V. (2020). New technologies and Amyotrophic Lateral Sclerosis—Which step forward rushed by the COVID-19 pandemic? *Journal of the Neurological Sciences*, *418*, 117081. <https://doi.org/10.1016/j.jns.2020.117081>

Pollock, D., Davies, E. L., Peters, M. D. J., Tricco, A. C., Alexander, L., McInerney, P., Godfrey, C. M., Khalil, H., & Munn, Z. (2021). Undertaking a scoping review: A practical guide for nursing and midwifery students, clinicians, researchers, and academics. *Journal of Advanced Nursing*, *77*(4), 2102–2113. <https://doi.org/10.1111/jan.14743>

Pousada García, T., Garabal-Barbeira, J., Porto Trillo, P., Vilar Figueira, O., Novo Díaz, C., & Pereira Loureiro, J. (2021). A Framework for a New Approach to Empower Users Through Low-Cost and Do-It-Yourself Assistive Technology. *International Journal of Environmental Research and Public Health*, *18*(6). <https://doi.org/10.3390/ijerph18063039>

Pradhan, A. M., Park, L., Shaya, F. T., & Finkelstein, J. (2019). Consumer Health Information Technology in the Prevention of Substance Abuse: Scoping Review. *Journal of Medical Internet Research*, *21*(1), e11297. <https://doi.org/10.2196/11297>

Sanchez, K. (2021). *Microsoft starts new program to help make more accessible games.* <https://www.theverge.com/2021/2/16/22286216/microsoft-xbox-games-tested-accessibility-guidelines>

Soundy, A., & Condon, N. (2015). Patients experiences of maintaining mental well-being and hope within motor neuron disease: A thematic synthesis. *Frontiers in Psychology*, *6*, 606. <https://doi.org/10.3389/fpsyg.2015.00606>

Trevizan, I. L., Silva, T. D., Dawes, H., Massetti, T., Crocetta, T. B., Favero, F. M., Oliveira, A. S. B., de Araújo, L. V., Santos, A. C. C., de Abreu, L. C., Coe, S., & Monteiro, C. B. de M. (2018). Efficacy of different interaction devices using non-immersive virtual tasks in individuals with Amyotrophic Lateral Sclerosis: A cross-sectional randomized trial. *BMC Neurology*, *18*(1), 209. <https://doi.org/10.1186/s12883-018-1212-3>

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K., Colquhoun, H., Kastner, M.,

Levac, D., Ng, C., Sharpe, J. P., Wilson, K., Kenny, M., Warren, R., Wilson, C., Stelfox, H. T., & Straus, S. E. (2016). A scoping review on the conduct and reporting of scoping reviews. *BMC Medical Research Methodology*, *16*, 15. <https://doi.org/10.1186/s12874-016-0116-4>

Villani, D., Carissoli, C., Triberti, S., Marchetti, A., Gilli, G., & Riva, G. (2018). Videogames for Emotion Regulation: A Systematic Review. *Games for Health Journal*, *7*(2), 85–99. <https://doi.org/10.1089/g4h.2017.0108>

Waito, A. A., Valenzano, T. J., Peladeau-Pigeon, M., & Steele, C. M. (2017). Trends in Research Literature Describing Dysphagia in Motor Neuron Diseases (MND): A Scoping Review. *Dysphagia*, *32*(6), 734–747. <https://doi.org/10.1007/s00455-017-9819-x>

Weber, R., Tamborini, R., Westcott, Baker, A., & Kantor, B. (2009). Theorizing Flow and Media Enjoyment as Cognitive Synchronization of Attentional and Reward Networks. *Communication Theory*, *19*(4), 397–422. <https://doi.org/10.1111/j.1468-2885.2009.01352.x>

Wickremasinghe, D., Kuruvilla, S., Mays, N., & Avan, B. I. (2016). Taking knowledge users' knowledge needs into account in health: An evidence synthesis framework. *Health Policy and Planning*, *31*(4), 527–537. <https://doi.org/10.1093/heapol/czv079>

Zarotti, N., Mayberry, E., Ovaska-Stafford, N., Eccles, F., & Simpson, J. (2021). Psychological interventions for people with motor neuron disease: A scoping review. *Amyotrophic Lateral Sclerosis & Frontotemporal Degeneration*, *22*(1–2), 1–11. <https://doi.org/10.1080/21678421.2020.1788094>





# *Opening The Door in Question: simulating schizophrenia and psychosis in XR and transmedia experiences*

TROY RAINBOW

## INTRODUCTION

---

### **Summoning the fire – backgrounds and motivations**

---

As an artist and researcher, my work focuses on the creation of Extended Reality (XR) and transmedia storytelling experiences which seek to convey and explore experiences of Schizophrenia, delusional belief systems and psychosis. This work is borne from a deeply personal place. My mother was diagnosed with schizophrenia, well before I entered the world. However, her illness was so debilitating that she became unable to care for me and I was ultimately made a ward of the state. Interactions with the mental health and legal systems never seemed to help her and our relationship was severely damaged as a result. Many sought to dehumanise her, both within the family and without. At times in my life, I too have been prone to psychotic episodes and I too have found limited help within the medical model of mental health. Most pressingly, I was struck by the persistent pathologising in the field of psychiatry and the unwillingness to engage with core emotional issues. Mental health issues have deep emotional

histories, but these are often left completely ignored in favour of numbing medications, whilst a lot of society either dismisses a person as crazy, or awkwardly turn away from uncomfortable behaviours without trying to understand them. It is for this reason that I have dedicated much of my time as an artist to researching and understanding schizophrenia and psychosis at a deeper level and is what has inspired me to use my practice to make XR works which transport people into the psychotic universe.

This article isn't an autobiography, nor a critique of the mental health system. However, this information is nonetheless important in underscoring the importance of us doing better as a society at understanding severe mental health conditions properly. Whilst public health initiatives such as *R U OK Day* and *Mental Health Awareness Month* are important (Kelly et al., 2007), this really only scratches the surface. People are still not understanding how to recognise mental illness and are also unwilling to help (Flourish, 2016). We see severe 'othering' and misconceptions about the origins of mental illness (Walsh & Foster, 2020) and people still believe that schizophrenics are more likely to commit violent crime when, in fact, they are more likely to have violent crimes committed *against* them (Varshney et al., 2016; Wehring & Carpenter, 2011). In the arts and entertainment, we still have the tendency to demonise and further stigmatise mental illness through caricatures. Bramesco (2017) discusses how the blockbuster *Split* (Shyamalan et al., 2017) is part of a lineage of misunderstanding of what is truly scary about mental illness. Johnson and Olson, (2021) offer a more wide-ranging critique of representations of mental illness across entertainment media. In *The Philosophy of Madness* (Kusters & Forest-Flier, 2020), Wouter Kusters describes psychosis as the escape from all language – a liberation by fire from the house of being. He argues that mental health professionals fear getting burnt from this fire if they get too close and that they are not interested in the highlights and pitfalls of madness at all. Instead, they seek to make it a clear and distant object to eradicate.

It could be said that what mental health professionals miss are the worlds created by psychosis. At the very least, they miss the different perspective on the same world that psychosis generates. As creatives working with technology, we have the capacity to build these worlds – simulations, if

you will – and embed audiences, participants and players in the subjective experience of another. The purpose of this article is to demonstrate how, through creative practice we can lift understanding of severe mental health issues by building contemporaneous psychotic and delusional belief system simulations through XR and transmedia theatre works. This is done primarily in relation to my XR Theatre work *The Door in Question*, August 2021 iteration, which is largely based on my lived experience and the writings of my late mother. In addition, existing clinical and simulations of schizophrenia and psychosis are examined, to illuminate what it is that *The Door in Question* does differently. Some other XR works that do not explore mental health are also discussed. Along with the autoethnographic foundations of my research, my practice is informed by psychological-phenomenological understandings of schizophrenia as well as neurodiversity. At times this will be drawn on, but it is not the main focus of this article.



*Image 1: Photo of people in custom wheelchairs, watching a 360 film.*

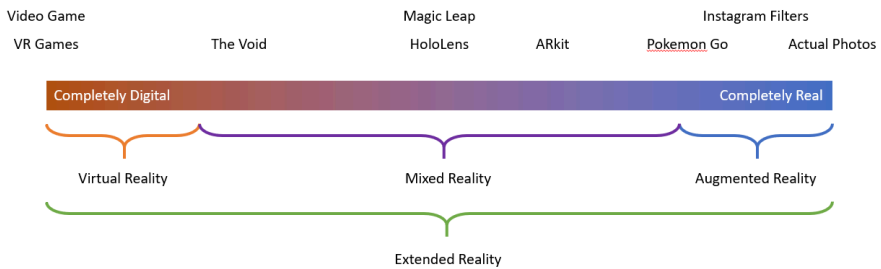
## Key Terms

---

XR refers to the integration of all ‘real’ (physical) and virtual realities found in the *reality-virtuality continuum* – a continuous scale which is used to plot

the spectrum between a completely virtual, and a completely real, reality (Paul Milgram et al., 1995). For the purposes of this article, XR can be thought of as an umbrella term, encompassing 360-degree film, Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR) simultaneously.

## Reality – Virtuality Spectrum



*Image 2: Adaptation of Reality-Virtuality continuum. (Paul Milgram et al., 1995; Skarbez et al., 2021)*

Transmedia storytelling is where elements of a fiction get dispersed systematically across multiple delivery channels in a cohesive story (Jenkins, 2010).

Technodramaturgy (Cegys & Weijdom, 2020; Fernandez, 2016; King, 2018) is an evolving approach to creation where technology is understood to play a more pivotal role in the formative processes of creative work. This concept is discussed in depth in the section: *Technodramaturgy in XR*.

## SIMULATING SCHIZOPHRENIA AND PSYCHOSIS IN XR

### Clinical and Artistic Simulations

Slater et al., (2010) explore First Person Experience of Body Transfer in Virtual Reality. This used first-person perspective (1PP), motor and touch synchronisation in a VR context to facilitate a body-ownership-illusion

(BOI). Slater et al. argue that 1PP creates significantly higher levels of empathy through a transfer of self. Linda Joy Gerry, and the *Machine to Be Another* project (Gerry, 2017) presented a gender swap experience to facilitate such empathy. Gerry argues for 'Virtual Alterity' – a process that activates both automatic and volitional (active) empathic processes by maintaining a self-other distinction that is not present in Slater's work.

Some artists have taken a broader based approach to simulation of the subjective experience and, in particular simulation of psychosis. *The Wearable* (Kanary Nikolov(a), 2016) is an interactive augmented reality cinema walk that functions as a 'do-it-yourself psychosis-kit'. *Altered States of Consciousness* was a live art experience that sought to simulate voice-hearing through live audio-feeds to the participants headphones. (Maskey, 2017; Riches et al., 2018). Both these works show the capacity for art to lift immersion levels in simulation through a more proactive dramaturgy.

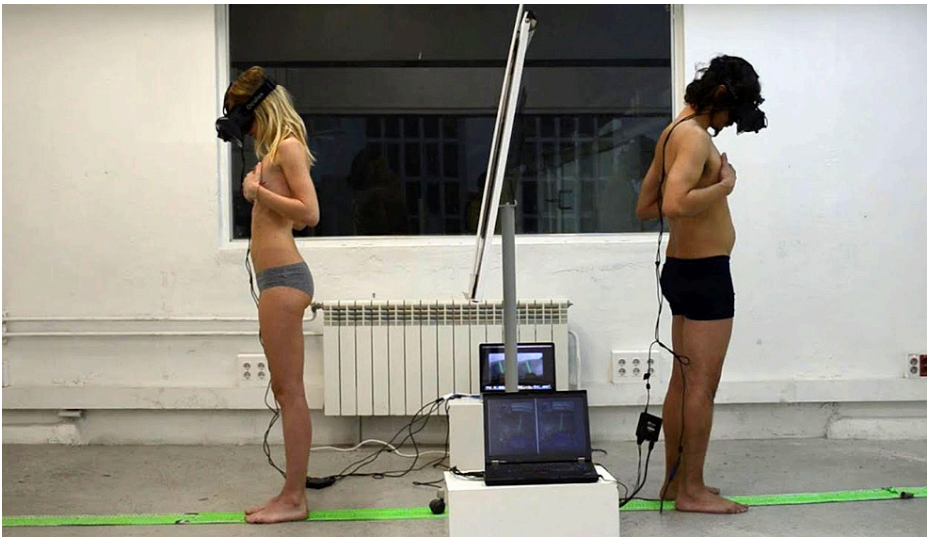


Image 1: Photo of *The Machine to Be Another's* Gender Swap experience. (Gerry, 2017)



*Image 2: Image from The Wearable (Kanary Nikolov(a), 2016)*

On the whole, clinical simulations appear to focus on a symptomology of psychotic experience, such as ‘voice hearing’ (Riches et al., 2018; Tabar, 2007; Wieland Diane et al., 2014), fractured vision (Kanary Nikolov(a), 2016) or delayed event-based reaction times (Spanlang et al., 2019). The latter was a VR experiment used by Spanlang et al. to argue that their simulation had the effect of ‘fragmenting the consciousness of healthy participants’. Such claims do seem an overreach. Whilst these works make use of some VR technology and do provide useful insights, their inherent minuteness of focus makes for a lack of world-building and, subsequently, experience immersion, for participants. It is therefore difficult to assert that such works do, in fact, simulate experiences of psychosis or schizophrenia in an effective manner, let alone fragment the consciousness of healthy participants.

### **The missing worlds - moving closer to the liberating fire of madness**

If we are to move beyond symptomology in simulations or, in line with Wouter Kuster’s (2020) assertions, dare to get burnt by the fire of madness, then we need to be able to use XR technology to illustrate what happens at the psychological-phenomenological level of schizophrenia. Here, we explore research in the phenomenology of schizophrenia and discuss

some of the impacts these understanding have had on the creation of *The Door in Question*.

Fuchs (2015) understands schizophrenia and 'mental illness' as an extended phenomenon – a process always taking place in between the patient and others. He describes schizophrenia as a breakdown of intersubjectivity – a disturbance of one's embodied interaction with others. In other words, rather than pathologise mental illness as a brain dysfunction he describes a process where an individual lacks flexibility to switch between one's own and other's points of view. When dealing with schizophrenia and delusional belief systems, he posits that a sense of being-with-others in a process of shared reality-making is replaced by a sense of detachment that may pass over into threatening alienation. That is, one may recognise another's existence, but may not recognise them as a mental agent of their own and thereby some may interpret other's actions as being wholly persecutory towards themselves.

In *The Door in Question*, participants are placed as the subjective mediator between two realities – embodied within a psychotic episode across virtual and physical reality. This is highlighted in the section '*Transition to Physical Reality*' where participants see a live camera feed of their physical selves displayed within a Virtual Reality environment inside a headset. This calls attention to their own reality making processes, showing them, for the first time within the experience, that they are an integral part of the story, witnessing their own intersubjective collapse.

Other psychological-phenomenological analysis of the sense of self experienced by people in psychosis is offered by Bradfield & Knight (2008) and Kusters & Forest-Flier (2020), whilst linguistic behaviours are discussed by Covington et al. (2005), and parallels with transcendental mysticism are discussed by Parnas & Henriksen (2016). Such insights offer both understanding and points for inspiration in the development of *The Door in Question*. These deeper considerations of subjective experience are necessary to understand in the process of creating a simulation of schizophrenia. Any XR experience which aims to assert itself as a simulation or representation of such a complex 'mental disorder' will be



lacking in presence and perspective, without considerations of the subjective experience from the psychological-phenomenological level.

### Technodramaturgy in XR

---

The Transition to Physical Reality example from *The Door in Question* could be described as a use of *technodramaturgy*, which is a term we will discuss here and one that is important in lifting the quality of psychotic simulation. XR and transmedia experiences, though still relatively new, appear to be in a state of transition from an emergent to a maturing state. An emerging field of practitioners are considering the application of immersive XR technologies within a dramaturgical setting more deeply (Bohse Meyer, 2020; Cegys & Weijdom, 2020; Davies, 2009, 2019; Fromell, 2018; Joris et al., 2018; Kates, 2020). This involves more than an 'updating' of traditional theatre, where technology provides solutions to creative problems, or better-quality lighting and audio systems are used. This *technodramaturgy* is emerging (Cegys & Weijdom, 2020; Fernandez, 2016; King, 2018), and is an evolving approach to creation where technology is understood to play a more pivotal role in the formative processes of creative work.

Theorist and Playwright Anchuli Felicia King credits herself with the term's coinage. She describes it as dramaturgies that arise from the use of a given technology, and does so in relation to Gregory Doran's production of *The Tempest* at the Royal Shakespeare Company (King, 2018), which uses motion capture driven avatars. However, King does not appear to have coined the term. Stephen Fernandez (2016) refers to a framework of 'critical techno-dramaturgies' that facilitates the design of an intermedial performance whilst critically analysing human-machine interaction in performance. Cegys & Weijdom (2020) the creators of Blue Hour VR, use the term to describe an iterative feedback system between the technology and creation process through embodied improvisations. Blue Hour was a work where people experience a work in VR, but do so inside a sports stadium filled with set, lighting and audio design, along with five hundred other people wandering the space simultaneously.



Image 3: *Blue Hour VR* (Cegys & Weijdom, 2019)

Similar concepts appear in the literature under different names. Kates (2020), the creator of *Bury The Wren* (An XR performance of the story of the Donnelly family, who were burnt to death by begrudging townfolk) refers to a “digital dramaturgy”. Bohse Meyer (2020) describes a ‘double scenography’ when analysing Makropol’s *Anthropia* work, whereby virtual and physical realities are equally accounted for in staging a work.

Technodramaturgy is central to the creation of *The Door in Question* and is something of a key missing ingredient from this article’s aforementioned simulations. Indeed, if we are to be constructing a contemporaneous delusional belief system, it should be multimodal and deploy a large variety of media and technology in order to create a world *surrounding* a participant – so much so that that it becomes truly difficult to discern where the boundaries lie between fact and fiction. For *TDIQ*, technodramaturgy is the glue that binds these disparate technologies together and describes how they function at both the technical and dramaturgical levels within the performance as well as the narrative itself.

## *THE DOOR IN QUESTION – TOWARD A TECHNODRAMATURGY*

---

## FOR FRACTURED MENTAL STATES

---

This section discusses *The Door in Question* project in depth. It will describe the technology used as well as the surrounding dramaturgical application with a discussion on how the elements are integrated. What is presented should not be considered fixed, but more as an evolving example of an XR technodramaturgy for schizophrenic states that will be iterated on and extended upon. Each item discussed will be developed further in subsequent iterations of this XR experience, so what is outlined below will serve as a formative methodology to develop from.

### Narrative Foundations

---

The script and scenography for *The Door in Question* August 2021 iteration was developed mostly using a combination of my own experiences, as well as writings of my late mother. This included childhood stories and presents, filings to courts and other authorities and accounts of interactions between my mother and others – among other things. I approached this material with a view to creating a cohesive narrative able to be understood by people outside of my own family. I framed the overarching narrative around a childhood birthday card I received which outlined – to my 11-year-old self – the phallic symbology of the snake and the mythological story of Medusa and tied this to a longer child's reader that my mother made me, which I used to develop a 360-degree film which forms part of the experience. Four characters exist within a delusional world – mummy, hottee, a child and a strange bureaucracy known as the World Congress. According to the first three characters, The World Congress is attacking them with a sonic weapons program (known as MEDUSA – Mob Excess Deterrent Using Silent Audio), intervening in their lives through all means possible.

Beyond the Medusa references, I identified four key delusions to spread across the narrative:

- Being sired via illegal artificial insemination.
- Allegations that legislation is made in ways that bare semblance to witchcraft, which is/was illegal.

- Killing a home invader in a bathtub.
- Accusations that my father tampered with electrical wires to deliberately harm my mother and myself.

## VR HMDs

---

The aforementioned 360 film introduces participants to the characters of the experience and to the world at large. This was largely shot from a child's Point Of View but is narrated by several different characters to introduce multiple perspectives and interpretations of the same events.



*Image 1: Still from "Mummy, Hottee and Little Boy" – 360-degree film content within TDIQ (Peterrs & Rainbow, 2021)*

Participants watch this film seated in a custom-made wheelchair, shown in Image 1.1. Whilst in this figurative blindfold, they are wheeled to four separate rooms, each representative of one of the characters in the film.

## Transition to Physical Reality

---

A transition from 360 film to Virtual Reality occurs, where participants find themselves in a virtual (Point Cloud) environment with a live camera feed of themselves inside a strange room projected back to them inside the

headset. They are transitioned out of their handset by a character who dramatically infers, through pre-recorded narration, that they should take off their headsets.

Knowing the importance of the moment that occurs when leaving a VR headset (Knibbe et al., 2018) and the pivotal role this would play in creating a sense of fragmentation, I devised a narrative line and musical motif that would not 'break the spell' but also instruct the participant to remove their headset of their own volition. I chose the most authoritative sounding character to speak the following lines:

*If you are, somehow, of the belief, that affixing a device to your head will help you to escape yourself, you are surely – and sorely – mistaken!*

This, in combination with seeing oneself on a live feed in a VR headset, was remarked upon as an equally terrifying and exhilarating moment by participants – one that framed to them they were inside something that was inescapable; something akin to Wouter Kusters (2020) description that 'psychosis presents itself to the psychotic as an inescapable truth and reality.'



*Image 2: Virtual Reality space of 'child's room' – TDIQ. NB: This is test footage, which displays a stream of a street where the participant would actually be viewing themselves. (Lovell & Rainbow, 2021)*

Here is a comment from a participant, describing their experience at this moment:

*I look above the top right corner of the chimney, to discover something that lifts my stomach. I am myself being watched, I see myself, in complete darkness in an unknown room. I quickly remove the headset and headphones to discover that I am no longer in a virtual experience but in someone's living room, a place I've never been too, that has been turned upside down from what I can sense in the dark. I feel a sense of utter loneliness and helplessness wash upon me in unknown chaos and feel the urge to try to escape. [I am surrounded by] a delusional form of love that [feels] like imprisonment, like a shuttered soul.*

### Transmedia installation

---

Once participants remove their headsets, they each find themselves in a separate character's room. Here, they experience separate narrations. Each room contains embedded speakers, as well as directional speakers and a combination of interactive and programmed lighting sequences that occur in highly detailed set designs across four rooms – a bathroom, a lounge room, a court room and a child's bedroom. Each room also contains a TV screen. In this transmedia environment, participants experience narrated stories from the characters explaining the first-person accounts of delusional experiences. AI rotoscoping is used to represent the characters on the screens. In addition, participants experience exchanges between the characters where conflicting narratives seem to occur. Specific smells are used for each room, in line with Klich's 'Visceral Dramaturgies' (Klich, 2019) to create further presence. At other points, live camera feeds from opposing rooms display on the screens in the rooms, giving brief insight into another's experience, but making one uncertain of who it is that may be watching them as well.



*Image 3: 'Child's Room' in TDIQ (Delaney, Peters, Rainbow 2021)*



*Image 4: 'Mother's Room' in TDIQ (Delaney, Peters, Rainbow 2021)*

## Delusion Bot

---

*This section is contributed by Lee Meyer, AI programmer for The Door in Question.*

Deployed in *The Door in Question*, 'Delusion Bot' draws on ConceptNet Semantic framework (Speer et al., 2019) and synthesised versions of the voice actors voices developed with Microsoft's Custom Neural Voice. The result is a phone call that the participants experience partway through their transmedia based psychotic episode, where they answer a series of



questions. Delusion Bot takes the participant's input and devises a series of associations to tie the input back into a pre-programmed delusion found in the *Narrative Foundations* section of this document. In turn, the phone call interacts with the Audio-Visual server so that the input of the participant affects their transmedia environment.

Through an absurd word-association game halfway through the performance, Delusion Bot simulates chronic, systemic delusions in the way that they incorporate themselves into every area of a person's life through elaborate logic and leaps of logic (Norra and Hoff, 2007). Research indicates that paranoid variety of delusions are the most common when delusional thinking sets in at a later stage in life (Paolini, Moretti and Compton, 2016). That finding matches Troy's experience with his mother. There is a persecutory and paranoid element played up in each of the four possible randomly selected delusions that Delusion Bot can output at the end of its delusional strings. Here is a transcript of a conversation between a participant and the Delusion Bot:

*Delusion Bot: 'It's me. The penis is symbolised in psychiatry by the snake. Psychiatrists like to play a game with their patients. I say a word, then you say the first word that comes into your head. Got it? Ok, what do you think of when I say Library?'*

*User: 'Silence'*

*Delusion bot: 'Relaxing requires silence. Going outside for an evening causes relaxation. Going outside for an evening causes cancer. Cancer is a disease. Domestic violence is a disease. Hottee tampered with the wires to make us freeze to death as a form of domestic violence.'*

Although the bot introduces the conversation as a game, any response the participant makes will cause the bot to reply with humorously snarky comments, hanging up in disgust after the third response. The completion of the call triggers jump-scare effects in the room via OSC commands sent to Ableton and Resolume. This simulates the experience of a "parentified child" that becomes an extremely critical inner voice in an adult who in childhood was made to feel responsible for parental figures who caused the environment to be chaotic (Shwartz and Sweezy, pp. 144, 194, 223). Using Azure Custom Voice, the Delusion Bot synthesizes the voice of the actor who plays the character represented by the room in which the call is

received. This symbolizes the blurry line between inner voices and family members from childhood. We simulate the delusional brain using a graph database built from ConceptNet which is a knowledge graph of relationships between concepts. The bot traverses this graph from the concept mentioned by the participant to find an association between the input and one of four primary delusions. Since it's an experience recommended for mature audiences only, we switched off the profanity filter for participants' input and the output from the bot through Custom Voice, so the conversations can be as unpredictable and offensive as possible. When reviewing the call recordings, we observed participants laughing at the absurd leaps of logic and pre-programmed snarky responses. Our intent is comic relief midway through what can be an intense experience, but we are also making a point about the absurdity of the participants' own inner critics, encouraging them to laugh at their own disparaging inner voices but not at mental illness itself.

For future iterations, we have been able to obtain access to the private beta of GPT-3, a huge neural net that is the state of the art in natural language generation (Floridi & Chiriatti, 2020). The Door in Question has always been about creating more questions in the participant's mind than answers. In future we'd like to use longer generated AI responses based on freeform user input to shape the experience and let participants co-author their own experience and teach us about what it all means, rather than us telling them.

### Directional and immersive audio

---

The technodramaturgy is integral to how the technology informs the narrative development and vice-versa. As such, in *The Door In Question*, the question of how to integrate themes of Medusa into the technology arose. When researching the phenomenon of Targeted Individuals and Gang Stalking (Sarteschi, 2017) as well as sonic warfare (Friedman et al., 2019), I discovered that certain sonic weapons are referred to under the acronym MEDUSA – Mob Excess Deterrent Using Silent Audio (Hambling, 2008). This served as a narrative turning point. Given this consideration, and the disappointment with the results I had from some tests of directional speakers/parametric arrays at broadcasting the 'inner voice'

of characters, I repurposed the technology as a narrative device in and of itself – a sonic weapon. Using Virtual ANS, I created sounds based on isolated frequencies that could give the effect of being attacked by a sonic weapon. In turn, this drove numerous other plot devices within the experience.



*Image 5: Mannequin holding a directional speaker, which acts as a sonic weapon within TDIQ (Rainbow, 2021)*

### **Embedded Characters and the Fleeting-Improvised-Persons**

---

Schreber (1903) makes consistent reference to the concept of ‘fleeting-

improvised-men'. Schreber reported that, whilst housed in Sonnestein asylum, he physically experienced the dissolution of souls of the people around him. From the point of dissolution, Schreber posited that he held true communication with the individual whose soul had dissolved. Any physical manifestation of that person that appeared from that point forward was a 'fleeting-improvised-man' – a shell, or make-believe version, of that person. Anything that was said to Schreber by these Fleeting-Improved-Men was not to be believed over the communication which he had with that individual within his own mind.

As a character that simultaneously can be anyone and no one, fleeting-improvised-people are uniquely positioned within the Virtual and Physical worlds that are created. They can appear in both worlds and be any character. They also serve as a useful way to transition people between the worlds. These figures may act as a blank canvas for audience participants to project the stories they are hearing onto.

In addition to this, *The Door in Question* contains embedded characters. From the moment a ticket is purchased, communication with characters within the experience begins. All ticketing information and material is performed by a character who is later referenced numerous times within the experience. This is technodramaturgy at it's simplest – using technology to communicate in character to blur the lines between what is real and what is not.



*Image 6: Fleeting-Improvised-Person guiding a participant in TDIQ (Rainbow, 2021)*

## IMPACT AND REFLECTIONS

---

Ultimately the notion that one can simulate the mental experience of another person is, arguably, not possible – not in any sort of 1:1 relationship. There are simply too many variables at play. What VR technology affords is a sort of submersion tank, whereby the visual artifice convinces the wearer of a HMD that what they are experiencing is somewhat closer to another reality, even if they don't rationally believe it. A person who died in a chainsaw simulator for workplace training for instance, would not believe that they died, but having conducted the training in a headset may embed a deeper automatic recall when on the job than if they had completed the training simulator on a 2D system due to increased immersion and embodiment levels.

Indeed, placing someone in a headset with a simulation of what someone might experience during psychosis may create a greater sense of empathy for participants. However, are we really simulating a different reality if we are not playing with where the boundaries of physical and virtual realities are? What the door in question aims to do is simulate the subjective experience at the psychological-phenomenological level trying to bring

people inside the liberating fire of psychosis, through its complex mix of technology (not just a HMD) in a singular experience.

Unfortunately, a COVID-19 lockdown in Melbourne, Australia interrupted the August 2021 season of *The Door in Question*, placing it on hold. Because of this, we still await further reception and feedback at the time of writing. That being said, several shows did go ahead and elicited deeply emotional responses from participants. Perhaps the most profound learning is the way in which participants automatically related their own life experiences to the situation they found themselves in. I have included some anonymous testimonials to highlight some of these, without too:

*I feel a sense of utter loneliness and helplessness wash upon me as I am cast physically into this unknown chaos and feel the urge to try to escape. I fight the feeling and choose to remain into my seat, trying to calm my mind down. I look more closely around me, the light changes violently, I see myself on an old tv screen on my right, I see every corner of the room taking on a new face as the play of lights and shadow sculpt the space. Nothing for my eye to rest on. The face on the screen that used to be mine let place to a amorphous face of mother. I feel her around me, I feel her pain and suffering and I feel her inside me. Her perfume embalms the room, like an ancient tomb and her ghostly presence crawls under my skin. I hear her thoughts, her story, with unsettling familiarities with my own.*

This was so much so that, for one person, their memory of the events was impacted. Where a woman that was yelling at them within the experience, the participant remembered it as a male. This suggests that their sense of embodiment within the experience was so high that their perception was quite strongly altered.

It should be noted that, by design, *The Door in Question* intends to elicit differing perceptions among participants, dependent on the path they take in the experience. In the August 2021 iteration, participants experience one film at the beginning. However, four separate, individualised experiences follow thereafter. The intention with this was to see how participants interpreted their first experience once they experienced the second. Even though the story had no clear conclusions to it, there were drastic differences in the way participants felt and interpreted the events. Again, given the lockdowns, it is difficult to infer anything conclusive, but this is

something that will be researched and observed further when the season reopens and through subsequent iterations of *The Door in Question*.

*The author would like to acknowledge the contribution of Lee Meyer and Stephanie Peters.*

## REFERENCES

---

Armstrong, T. (2011). *The power of neurodiversity: Unleashing the advantages of your differently wired brain*. /z-wcorg/.

Baldyga, N. (2018). *The Hamburg Dramaturgy by G.E. Lessing: A New and Complete Annotated English Translation*. Taylor & Francis.

Barberia, I., Oliva, R., Bourdin, P., & Slater, M. (2018). Virtual mortality and near-death experience after a prolonged exposure in a shared virtual reality may lead to positive life-attitude changes. *PLOS ONE*, 13(11), e0203358. <https://doi.org/10.1371/journal.pone.0203358>

Bohse Meyer, R. S. (2020). The expansion of scenography in virtual reality theatre: Investigating the potential of double scenography in Makropol's *Anthropia*. *Theatre and Performance Design*, 6(4), 321–340. <https://doi.org/10.1080/23322551.2020.1854929>

Bourdin, P., Barberia, I., Oliva, R., & Slater, M. (2017). A Virtual Out-of-Body Experience Reduces Fear of Death. *PLOS ONE*, 12. <https://doi.org/10.1371/journal.pone.0169343>

Boyd, D. E., & Koles, B. (2019). An Introduction to the Special Issue “Virtual Reality in Marketing”: Definition, Theory and Practice. *Journal of Business Research*, 100, 441–444. <https://doi.org/10.1016/j.jbusres.2019.04.023>

Bramesco, C. (2017, January 25). Split is the latest horror film to misunderstand why mental illness is terrifying. *The Verge*. <https://www.theverge.com/2017/1/25/14385948/split-movie-m-night-shyamalan-james-mcavoy-horror-psycho-hitchcock>

Butcher, S. H. (2019). *The Poetics of Aristotle*. Good Press.

Cardullo, B., & Cardullo, P. B. (1995). *What is Dramaturgy?* P. Lang.

Cegys, P., & Weijdom, J. (2020). Mixing realities: Reflections on presence and embodiment in intermedial performance design of Blue Hour VR. *Theatre and Performance Design*, 6(1–2), 81–101. <https://doi.org/10.1080/23322551.2020.1785710>

Cermolacce, M., Naudin, J., & Parnas, J. (2007). The “minimal self” in psychopathology: Re-examining the self-disorders in the schizophrenia spectrum. *Subjectivity and the Body*, 16(3), 703–714. <https://doi.org/10.1016/j.concog.2007.05.013>

Chapman, R. (2017, January 25). Schizophrenia as Neurodiversity. *Intersectional Neuro-Diversity*. <https://intersectionalneurodiversity.wordpress.com/2017/01/25/schizophrenia-as-neurodiversity/>

Chapman, R. (2019). *Neurodiversity Theory and Its Discontents: Autism, Schizophrenia, and the Social Model of Disability*. <https://doi.org/10.5040/9781350024090.ch-018>

Chappell, B. (2019, Autumn). To (Phase) Cancel the Cops: An Acoustic Science of Insurrection. *Un Magazine*, 13(1). <http://unprojects.org.au/magazine/issues/issue-13-1/bridget-chappell/>

Clutton, P., & Gadsby, S. (2018). Delusions, Harmful Dysfunctions, and Treatable

Conditions. *Neuroethics*, 11(2), 167–181. <https://doi.org/10.1007/s12152-017-9347-2>

Constandi, M. (2019). Against neurodiversity. *Aeon*. <https://aeon.co/essays/why-the-neurodiversity-movement-has-become-harmful>

Corrigan Patrick W. & Wassel Abigail. (2008). Understanding and Influencing the Stigma of Mental Illness. *Journal of Psychosocial Nursing and Mental Health Services*, 46(1), 42–48. <https://doi.org/10.3928/02793695-20080101-04>

Covington, M. A., He, C., Brown, C., Naçi, L., McClain, J. T., Fjordbak, B. S.,



- Semple, J., & Brown, J. (2005). Schizophrenia and the structure of language: The linguist's view. *Schizophrenia Research*, 77(1), 85–98. <https://doi.org/10.1016/j.schres.2005.01.016>
- Fernandez, S. (2016). *Critical Techno-dramaturgy: Mobilizing Embodied Perception in Intermedial Performance*. <http://hdl.handle.net/10012/10263>
- Fink, P. J., & Tasman, A. (1992). *Stigma and Mental Illness*. American Psychiatric Press.
- Floridi, L., & Chiriatti, M. (2020). GPT-3: Its Nature, Scope, Limits, and Consequences. *Minds and Machines*, 30(4), 681–694. <https://doi.org/10.1007/s11023-020-09548-1>
- Flourish, A. (2016). *Australians and mental health How have things changed?*
- Friedman, A., Calkin, C., Adams, A., Suarez, G. A., Bardouille, T., Hacothen, N., Green, A.
- L., Gupta, R. R., Hashmi, J., Kamintsky, L., Kim, J. S., Laroche, R., MacKenzie, D., Milikovsky, D., Oystreck, D., Newton, J., Noel, G., Ofer, J., Quraan, M., ... Bowen, C. (2019). Havana Syndrome Among Canadian Diplomats: Brain Imaging Reveals Acquired Neurotoxicity. *MedRxiv*, 19007096. <https://doi.org/10.1101/19007096>
- Fromell, A. (2018). Dramaturgical possibilities within virtual realities: Notes from AΦE's VR-performance Whist. *International Journal of Performance Arts and Digital Media*, 14(2), 139–144. <https://doi.org/10.1080/14794713.2018.1499386>
- Fuchs, T. (2015). Corporealized and Disembodied Minds A Phenomenological View of the Body in Melancholia and Schizophrenia. *The Johns Hopkins University Press*.
- Gerry, L. (2017). *Virtual Reality as a Tool to Facilitate Empathy: Embodied Simulations and Perspective Taking in the Body of Another*. <https://doi.org/10.13140/RG.2.2.34886.57924>
- Hambling, D. (2008, July 3). Microwave ray gun controls crowds with noise.

*NewScientist*. <https://www.newscientist.com/article/dn14250-microwave-ray-gun-controls-crowds-with-noise/>

Hode, M. G. (2012). *The Tyranny of Neuronormativity: Neurotypical Privilege in Communication*. University of Columbia. <https://www.academia.edu/1539557/>

The\_Tyranny\_of\_Neuronormativity\_Questioning\_Neurotypical\_Privilege\_in\_Communication

Jenkins, H. (2010). Transmedia Storytelling and Entertainment: An annotated syllabus. *Continuum*, 24(6), 943–958. <https://doi.org/10.1080/10304312.2010.510599>

Johnson, M. A., & Olson, C. J. (2021). *Normalizing mental illness and neurodiversity in entertainment media: Quietening the madness*. Abingdon, Oxon.

Jorm, A. F., Korten, A. E., Jacomb, P. A., Christensen, H., & Henderson, S. (1999). Attitudes towards people with a mental disorder: A survey of the Australian public and health professionals. *Australian and New Zealand Journal of Psychiatry*, 33(1), 77–83. <https://doi.org/10.1046/j.1440-1614.1999.00513.x>

Kanary Nikolov(a), J. (2016). *Labyrinth psychotica: Simulating psychotic phenomena*. Plymouth.

Kardong-Edgren, S. (Suzie), Farra, S. L., Alinier, G., & Young, H. M. (2019). A Call to Unify Definitions of Virtual Reality. *Clinical Simulation in Nursing*, 31, 28–34. <https://doi.org/10.1016/j.ecns.2019.02.006>

Kates, B. (2020). *Incandescent Edges of the Future: Performance Creation with Virtual, Augmented and Carbon Realities*. PRISM. <http://hdl.handle.net/1880/112510>

Kelly, C. M., Jorm, A. F., & Wright, A. (2007). Improving mental health literacy as a strategy to facilitate early intervention for mental disorders. *Medical Journal of Australia*, 187(S7), S26–S30. <https://doi.org/10.5694/j.1326-5377.2007.tb01332.x>

Kelly, P. (2020). *Diversity, inclusion, and representation in contemporary dramaturgy: Case studies from the field*. Routledge.

King, A. F. (2018a, January 11). "These are not natural events" Ariel's Technodramaturgy in the Royal Shakespeare Company's *The Tempest*. *Howlround*. <https://howlround.com/these-are-not-natural-events>

King, A. F. (2018b). Moving masks and mobile monkeys: The technodramaturgy of Augmented Reality puppets. *Theatre and Performance Design*, 4(4), 324–341. <https://doi.org/10.1080/23322551.2018.1558539>

Klich, R. (2019). *Visceral Dramaturgies: Curating Sensation in Immersive Art* (Vol. 18). <https://doi.org/10.16995/bst.319>

Knibbe, J., Schjerlund, J., Petraeus, M., & Hornbæk, K. (2018). *The Dream is Collapsing: The Experience of Exiting VR* (p. 13). <https://doi.org/10.1145/3173574.3174057>

Kunert, H. J., Norra, C., & Hoff, P. (2007). Theories of Delusional Disorders. *Psychopathology*, 40(3), 191–202. <https://doi.org/10.1159/000100367>

Kusama, Y. (n.d.). *Infinity Mirror Room*.

Kusters, W., & Forest-Flier, N. (2020). *A Philosophy of Madness: The Experience of Psychotic Thinking*. MIT Press. <https://books.google.com.au/books?id=7s7tDwAAQBAJ>

Lessing, G. E., Arons, W., Figal, S. E., & Baldyga, N. (2019). *The Hamburg dramaturgy*. [/z-wcorg/](http://z-wcorg/).

Luckhurst, M. (Ed.). (2006). Bertolt Brecht: The theory and practice of the dramaturg. In *Dramaturgy: A Revolution in Theatre* (pp. 109–151). Cambridge University Press; Cambridge Core. <https://doi.org/10.1017/CBO9780511486050.005>

Mann, S., Furness, T., Yuan, Y., Iorio, J., & Wang, Z. (2018). *All Reality: Virtual, Augmented, Mixed (X), Mediated (X,Y), and Multimeditated Reality*.

Maskey, R. (2017). *Altered States Of Consciousness* [Live immersive multimedia installation]. <http://alteredstates.io/>

- Nishi, L. (2018). Harmful Dysfunction and Mental Illness. *Aporia*, 18(1), 1–8.
- Okada, F., Tokumitsu, Y., Hoshi, Y., & Tamura, M. (1994a). Impaired interhemispheric integration in brain oxygenation and hemodynamics in schizophrenia. *European Archives of Psychiatry and Clinical Neuroscience*, 244(1), 17–25. <https://doi.org/10.1007/BF02279807>
- Paolini, E., Moretti, P., & Compton, M. T. (2016). Delusions in first-episode psychosis: Principal component analysis of twelve types of delusions and demographic and clinical correlates of resulting domains. *Psychiatry Research*, 243, 5–13. <https://doi.org/10.1016/j.psychres.2016.06.002>
- Peck, T. C., Seinfeld, S., Aglioti, S. M., & Slater, M. (2013). Putting yourself in the skin of a black avatar reduces implicit racial bias. *Consciousness and Cognition*, 22(3), 779–787. <https://doi.org/10.1016/j.concog.2013.04.016>
- Riches, S., Maskey, R., Dishman, P., Benjamin MBE, J., Waddingham, R., Tebrook, C., Mundy, E., Roberts, P., & Fisher, H. L. (2018). Development, implementation and evaluation of Altered States of Consciousness: An immersive art exhibition designed to increase public awareness of psychotic experiences. *Arts & Health*, 1–19. <https://doi.org/10.1080/17533015.2018.1443948>
- Rivkin, P., M. D., & Barta, P., M. D. ., Ph. D. (2017, August 2). *Thought Disorder*. Johns Hopkins Psychiatry Guide; Johns Hopkins Guide. [https://www.hopkinsguides.com/hopkins/view/Johns\\_Hopkins\\_Psychiatry\\_Guide/787025/all/Thought\\_Disorder](https://www.hopkinsguides.com/hopkins/view/Johns_Hopkins_Psychiatry_Guide/787025/all/Thought_Disorder)
- Ross, A. M., & Bassilios, B. (2019). Australian R U OK?Day campaign: Improving helping beliefs, intentions and behaviours. *International Journal of Mental Health Systems*, 13(1), 61. <https://doi.org/10.1186/s13033-019-0317-4>
- Rush, W. (2016). *Hypersonic music: Determining new musical experiences in the parametric acoustic array*.
- Sarteschi, C. M. (2017). Mass Murder, Targeted Individuals, and Gang-Stalking: Exploring the Connection. *Violence and Gender*, 5(1), 45–54. <https://doi.org/10.1089/vio.2017.0022>

Schrader, S., Jones, N., & Shattell, M. (2013). Mad Pride: Reflections on Sociopolitical Identity and Mental Diversity in the Context of Culturally Competent Psychiatric Care. *Issues in Mental Health Nursing, 34*(1), 62–64. <https://doi.org/10.3109/01612840.2012.740769>

Schwartz, R. C., & Sweezy, M. (2019). *Internal Family Systems Therapy, Second Edition*. Guilford Publications.

Shyamalan, M. N., Bienstock, M., Blum, J., McAvoy, J., Taylor-Joy, A., Buckley, B.,

Richardson, H. L., Sula, J., Thordson, W. D., Ciarrocchi, L., Gioulakis, M., Universal Pictures (Firm), Blinding Edge Pictures, Blumhouse Productions, & Universal Pictures Home Entertainment (Firm). (2017). *Split*. /z-wcorg/.

Singer, J. (1998). *Odd People In: The Birth of Community Amongst People on the Autistic Spectrum: A personal exploration of a New Social Movement based on Neurological Diversity*. Faculty of Humanities and Social Science, University of Technology.

Singer, J. (2017). *Neurodiversity: The Birth of an Idea*.

Skarbez, R., Smith, M., & Whitton, M. C. (2021). Revisiting Milgram and Kishino's Reality-Virtuality Continuum. *Frontiers in Virtual Reality, 2*, 27. <https://doi.org/10.3389/frvir.2021.647997>

Skopec, R. (2019). New Psychological Weapons Make Targets Hallucinate. *American Journal of Biomedical Science & Research, 2*. <https://doi.org/10.34297/AJBSR.2019.02.000574>

Slater, M., Spanlang, B., Sanchez-Vives, M. V., & Blanke, O. (2010). First Person Experience of Body Transfer in Virtual Reality. *PLOS ONE, 5*(5), e10564. <https://doi.org/10.1371/journal.pone.0010564>

Speer, R., Chin, J., & Havasi, C. (2019). *ConceptNet 5.5: An Open Multilingual Graph of General Knowledge*.

Stephensen, H., & Parnas, J. (2018). What can self-disorders in schizophrenia tell us about the nature of subjectivity? A psychopathological

investigation. *Phenomenology and the Cognitive Sciences*, 17(4), 629–642. <https://doi.org/10.1007/s11097-017-9532-0>

Varshney, M., Mahapatra, A., Krishnan, V., Gupta, R., & Deb, K. S. (2016). Violence and mental illness: What is the true story? *Journal of Epidemiology and Community Health*, 70(3), 223. <https://doi.org/10.1136/jech-2015-205546>

Wakefield, J. C. (2017). Can the Harmful Dysfunction Analysis Explain Why Addiction is a Medical Disorder?: Reply to Marc Lewis. *Neuroethics*, 10(2), 313–317. <https://doi.org/10.1007/s12152-017-9330-y>

Walker, N., & Raymaker, D. M. (2021). Toward a Neuroqueer Future: An Interview with Nick Walker. *Autism in Adulthood*, 3(1), 5–10. <https://doi.org/10.1089/aut.2020.29014.njw>

Walsh, D., & Foster, J. (2020). A Contagious Other? Exploring the Public's Appraisals of Contact with 'Mental Illness'. *International Journal of Environmental Research and Public Health*, 17(6). <https://doi.org/10.3390/ijerph17062005>

Wehring, H. J., & Carpenter, W. T. (2011). Violence and Schizophrenia. *Schizophrenia Bulletin*, 37(5), 877–878. <https://doi.org/10.1093/schbul/sbr094>

Wieland Diane, Levine Ciara, & Smith Janet. (2014). Hearing Distressing Voices Clinical Simulation: "Life Changing" Experiences of Psychiatric-Mental Health Nursing Students. *Journal of Psychosocial Nursing and Mental Health Services*, 52(10), 42–51. <https://doi.org/10.3928/02793695-20140911-01>

Wright, R. (2018). *Mixed Reality Re-assembled: Software Assemblages at the Edge of Control*.



# *Mental Jam: video game co-creation for young people with lived experiences of depression and anxiety*

HSIAO-WEI CHEN

## ABSTRACT

---

MENTAL Jam explores the knowledge translation of young peoples' lived experiences of depression and anxiety through video game co-creation. Prior research in this area has shown different artistic mediums can be used to portray stories as a form of self-expression and to raise community awareness. Video games offer interactive and immersive experiences that can inspire players to gain knowledge of the lived perspectives of others. Through a participatory action research methodology, this research will develop a program of game jam workshops that will facilitate the co-creation of video games with participants with lived experience of depression and anxiety using diverse video game design approaches, such as narrative-driven game design. I report the results from one of the game jam workshops through which a game called *Amour de Soi* was produced.

## INTRODUCTION

---

MENTAL Jam is a series of game jam workshops that facilitate the



knowledge translation of young peoples' lived experiences of depression and anxiety through video game design. I used the Participatory Action Research (PAR) methodology to bring together young people with lived experiences of depression and anxiety in collaboration with video game developers. Participants co-create video games about their personal experiences as a form of self-expression to build empathy and promote mental health awareness in the community. This paper is a report from one of the game jam workshops, which produced a game called *Amour de Soi*.

## REVIEW OF LITERATURE

---

### Knowledge Translation of Lived Experiences of Depression and Anxiety through Arts

---

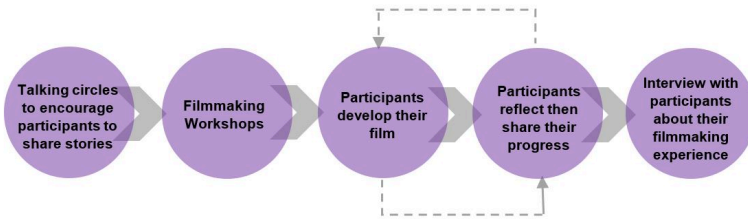
Traditionally, research findings are published and disseminated in academic journals, however often they do not reach their intended audience, and there is a knowledge gap between research and practice (Pablos-Mendez & Shademani, 2006). To address this, Knowledge Translation (KT) was introduced by the Canadian Institute of Health Research (2000) to ensure that knowledge is disseminated, exchanged, and applied by stakeholders to improve the health system (WHO, 2005). KT also focus on the people being studied and give importance to tacit knowledge from their experiences and practice (Pablos-Mendez & Shademani, 2006).

KT has increased interest in the field of mental health because it provides broader perspectives from a wider range of participants and values their experiential knowledge (Caron-Flinterman et. al., 2005; Goldner et. al., 2011). KT has been applied to increase mental health literacy and awareness via art, such as *Digital Storytelling* (Tilleczek & Loebach, 2015).

*Digital Storytelling* is a participatory videography project *with, for and by* Canadian Aboriginal youth about their experiences with digital media and its role on mental wellbeing (Tilleczek & Loebach, 2015; Tilleczek, 2016; Loebach et. al., 2019). The research engages participatory videography as their approach because it engages the participants as filmmakers, storytellers and researchers, who ultimately determine how they are

represented in the film and how their story is told within and beyond their communities (Evans and Foster, 2009; Lomax et. al., 2011).

To co-create the research with participants, the researchers organised talking circles to encourage participants to share their stories, and workshops to teach them digital storytelling, storyboarding, and the creative and technical aspects of filmmaking (see Figure 1; Tilleczek & Loebach, 2015; Tilleczek, 2016; Loebach et. al., 2019). The researchers also emphasized the importance of the process of making the film, from ideation to production, and they also included deliberate reflections to encourage the youth to share their creative filmmaking process (Tilleczek & Loebach, 2015). The researchers continually asked for feedback from their participants and adjusted the project accordingly (Tilleczek & Loebach, 2015; Loebach et. al., 2019). imageInterview with participants about their filmmaking experience



*Figure 1: Digital Storytelling Facilitation Process (adapted from Tilleczek & Loebach, 2015; Tilleczek, 2016; Loebach et. al., 2019)*

These arts-based knowledge translation projects inform my research because I am also exploring alternative ways of presenting knowledge from the lived experience of depression and anxiety to the public. While my research will explore the use of video game co-creation as a medium of artistic self-expression with young people self-identifying as experiencing depression and anxiety. Video games can be a powerful medium for telling people’s stories, as they are interactive and immersive, and they can inspire players to gain a more insightful understanding of the experiences of others (Solberg, 2016). Video game development is also multidisciplinary, covering design, art, storytelling, music, programming, which provide multiple platforms for people with lived experience to tell their stories,

such as through the narrative, art, music, and game mechanics. My research focuses on the design process to understand how lived experience stories may translate into games.

### Representation of Depression and Anxiety in Video Games

---

There is a rise of empathy games that explore mental health from a personal experience, whose aim is not therapeutic. Empathy games are video games that hope to inspire players to walk a mile in someone else's shoes (Solberg, 2016). In empathy games, the main experience is driven by players' desire to understand and relate to the emotions of other avatars or players (Caballero, 2014).

The multidisciplinary nature of video game development allows the experiential knowledge from people with lived experiences of depression and anxiety to be translated through different platforms, such as through narrative and game mechanics (Rusch, 2017). According to Rusch, there are two different approaches that game developers can take, incorporating it in its narrative using a literal approach, and representing it through game mechanics using a metaphor (Rusch, 2017).

Narrative-driven game design takes a literal approach to teach players about depression through its narrative writing. Empathy games are often developed as a form of artistic self-expression based on the game developers lived experiences.

For example, *Actual Sunlight* is a narrative-driven interactive story, where the player plays as someone who is suffering from depression as they go through their everyday life. The game represents the helplessness people feel during depression. Even though the player is presented with story passages and choices that can influence the character's life, since depression is debilitating, some of the choices presented to the player are disabled, because though the player is aware of the choice, is unable to act on it, and the games may not end positively. In *Actual Sunlight's* climactic ending, all the other choices are disabled, and the player is left with no other choice but to "Go up to the roof and jump off" (WZO Games, 2013). Even though *Actual Sunlight's* narrative and the ending was bleak, some

players treated it as a cautionary tale, while some players related with the character and found comfort in knowing that they were not alone in those painful experiences. The game also fostered a sense of community as players shared their stories and words of encouragement on message boards (Hoffman, 2017).

While Rusch advocates the use of metaphorical game design, which uses game mechanics to portray metaphors (Rusch, 2017). Even though the literal approach can portray the observable aspects of depression, particularly the symptoms such as the loss of control shown in *Actual Sunlight*, metaphors can portray not just the symptoms, but the inside view of what depression feels like (Rusch, 2017). Some of the games she led are *Elude* (GAMBIT Singapore, 2010), *Soteria* and *For the Records*. *Elude* is a 2D platformer game that represents depression, players explore a forest, jumping up to climb trees and call out to birds, which represents 'passion' in the game. Eventually, you reach the sky, which represents 'happiness', however, without warning, black snake-like vines grab you and drag you down, which represents 'depression' (Rusch, 2012).

I have highlighted the different ways depression and anxiety have been portrayed in video games through narrative and game design approaches. These approaches will inform my research, as they will guide my participants in the knowledge translation of their experiences through game design. I will run a couple of game jam iterations, with each one focusing on a different game design approach. For the first game jam, participants will develop a game guided by narrative game design.

### Participatory Methods to Develop Video Games

---

Game developers have adopted different participatory design methods to collaborate and get feedback from lay participants with lived experience during the development of their games (Rusch, 2017). One participatory methodology that has been used by game developers to collaborate with people with lived experience to develop games is Participatory Action Research.

## Participatory Action Research

---

As mentioned previously, Participatory Action Research (PAR) is a participatory methodology that encourages the close collaboration between researchers and participants, to co-create new knowledge through a cycle of action and reflection (Bergold & Thomas, 2012).

The advantages of this approach for my research, as compared with some more traditional approaches are researchers work *with* participants in all the phases of the research, from design to execution and dissemination (Vollman, Anderson & McFarlane, 2004; Smith et. al., 2010). This presents a shift to a balance of power dynamics between researcher and participants, which allows the creation of new knowledge from minority voices, which might not otherwise be heard (Fals-Borda & Rahman, 1991; Rose & Kalathil, 2019). Traditional research may exclude some participants who may not feel equipped to express their experiences through academic writing (Fricker, 2013; Groot et. al., 2020; Rose & Kalathil, 2019). Some participants have reported that they felt their experiential knowledge is undervalued as they were not present in the reporting phase conducted by academic researchers (Fricker, 2013; Groot et. al., 2020).

To ensure participants experiential knowledge is valued and represented in the final output of the research, researchers may be required to go beyond conventional methods (Smith et. al., 2020), such as exploring arts-based knowledge translation strategies and game jams. Game jams are events that promote the participation of multidisciplinary teams to co-create games based on a given theme from start to finish (Bayrak, 2017; Kultima, 2015). To contextualise my research project, I will briefly describe game jams and their process.

## Game Jams

---

Since the inception of game jams in 2002, it has grown in popularity (Kultima, 2015), with Global Game Jam that attracted more than 48000 participants from physical sites around the world in 2020 (Global Game Jam, 2020). While Ludum Dare's latest iteration attracted more than 13000 participants online (Ludum Dare, 2020). There is also a multitude of smaller

game jams organised by individuals, companies and even researchers, as physical events or on online platforms, such as itch.io (Kultima, 2019).

Participants are motivated to join game jams for their interest in game development, to learn or improve their game development skills, and to socialise with other game developers (Reng et. al., 2013; Kultima, 2019). Participating in game jams give participants a sense of belonging in their game development community (Turner & Thomas, 2020). Game jams are also considered a rite of passage for game developers because it allows participants to experience the whole process of game development from ideation to release in a low-stakes and experimental environment (Thomas & Owen, 2013; Deen et. al., 2014; Faas et. al., 2019).

Game jams are fast-paced events that occur in a short amount of time, ranging from 48 hours to a month (Foltz et. al., 2019), and they have three phases: 1) pre-jam, 2) the jam itself, and 3) post-jam (Faas et. al., 2019).

During the pre-jam phase, participants form teams. They can work solo or in multidisciplinary teams, with a distribution of skills, such as programming and art (Reng et. al., 2013). For game jams in physical locations, participants are encouraged to work in multidisciplinary teams (Faas et. al., 2019). Some game jam organisers facilitate team formation to ensure there is a balance of skills and interests in each team (Reng et. al., 2013; Faas et. al., 2019). In the case of online game jams, some organisers use a chat platform, such as Discord, to allow participants to socialise and form teams (Faas et. al., 2019). Faas et. al. conducted a study on online game jams, and they found that many participants preferred to work alone due to scheduling concerns, such as time zones and availability (Faas et. al., 2019). However, working solo requires participants to have a wide set of skills, including programming and art (Faas et. al., 2019).

The second phase is the jam itself, which also includes activities such as ideation and development. The ideation process is guided by the game jam's theme (Ho, 2017). Ho and his colleagues also investigated the use of different idea generation toolkits, such as IDEO's design thinking (Brown, 2008), that aid participants in their ideation process (Ho, 2017). For my research, my participants will also be guided by IDEO's design thinking (Brown, 2008). IDEO's field guide includes step-by-step instructions for

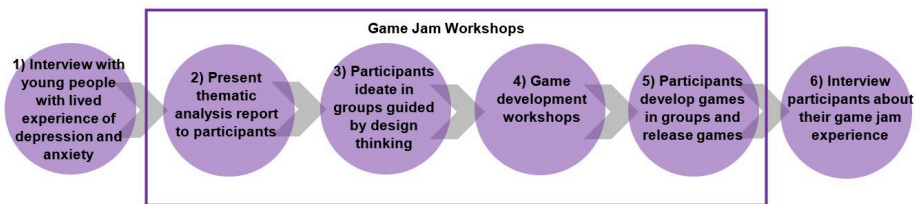
ideation activities, such as brainstorming and storyboarding (IDEO, 2015). The game development process during a game jam is as important as the games produced (Locke et. al., 2015). For online game jams, such as Ludum Dare, participants are encouraged to share their work in progress through blogs in their online community (Turner et. al., 2013; Locke et. al., 2015).

The last phase is the post-jam phase, where the games produced are released publicly. This phase is important as it gives participants a sense of accomplishment, and it also provides them with a venue to get feedback on their games from a wider audience, which will help them improve for future game jams and their game development practice (Faas et. al., 2019).

Game jams have also been adapted as a participatory design method by researchers to explore solutions to real-world problems (Kultima, 2015; Bayrak, 2017). My research aims to develop a game jam workshop process that will facilitate the co-creation of video games as a knowledge translation tool with young people with lived experiences of depression and anxiety.

## METHODS

---



*Figure 2: Game Jam Workshop Process for MENTAL Jam*

My game jam workshop process has 6 activities, as follows (see Figure 2):

- Interview with young people with lived experience of depression and anxiety
- Present thematic analysis report to participants
- Participants ideate in groups guided by design thinking

- Game development workshops
- Participants develop games in groups and release games
- Interview participants about their game jam experience

### **Interview with young people with lived experience of depression and anxiety**

---

For this research, the inclusion criteria include two groups of participants: 1) Young people, aged 18 to 25, with self-identified lived experience of depression and/or anxiety, who are currently, by their own account, sufficiently well to participate in research, and have an interest in gaming and/or in learning game development; and 2) Game developers, aged 18 and above, which include programmers, artists, game designers, writers, and musicians. While the exclusion criteria are people under the age of 18, and people with lived experience of depression and/or anxiety, who are not sufficiently well to participate in research.

I recruited eleven participants via social media, such as game industry groups on Discord and Facebook, and my personal Instagram. The participants are mostly students, while two participants are working full-time. Most of the interview participants are based in Australia, while some participants are international students. While two participants are based in Vietnam and one participant is based in the Philippines.

I conducted interviews with the participants on Microsoft Teams, which lasted from 20 minutes to an hour. Some participants had their video cameras on, while two opted not to turn on their video cameras. Participants were advised that they should inform me if they experience distress at any time and we can stop the interview. Participants were invited to give an uninterrupted account of their lived experiences of depression and/or anxiety. I also asked some follow up questions to clarify aspects of their experiences. For two participants, one who is currently studying games design and another who is working in the games industry, we also talked about their interest in game development and what inspired them to want to develop games about mental health.

The interviews were video recorded and transcribed initially by the



automated transcription software, Otter. I manually checked the transcripts for accuracy, and I also emailed the transcripts to participants to give them an opportunity to member check and remove or edit any sections. I used Nvivo software to organise the interview transcripts and aid in coding for thematic analysis (Braun & Clarke, 2006).

### Present thematic analysis report to participants

I have identified six themes from the interviews: “Views about the Causes of Depression and/or Anxiety”, “Experiencing Depression and/or Anxiety”, “Support and Challenges”, “Recovery”, “Message to Others” and “Game Ideas”. I also developed a password-protected website to showcase the themes along with some excerpts from interview transcripts (see Figure 3).



Figure 3: Website featuring Themes from Interview Transcripts

The website also has word clouds for the different codes from each theme (see Figure 4.6), the size of the codes in the word cloud is based on how frequent they were mentioned in the interviews.

The excerpts from the interview transcripts are deidentified, and colour coded based on the different participants (see Figure 4). Participants are also given pseudonyms. The website will also feature the screenshots from the games developed during the game jam workshops, alongside the codes and interview transcripts they were based on (see Figure 4).



Figure 4: Website featuring Excerpts from Interview Transcripts and Game Screenshots

## Participants ideate in groups guided by design thinking

I divided the interview participants into groups of 2, and I will be embedded in each team as a researcher, programmer, artist, and game designer. I selected the teams based on common themes from their lived experiences, as well as their skills and interests. This paper will discuss the game developed by the first group, which is composed of Rachel, who is working full-time as a programmer based in the Philippines, and Natalie, who is a student studying Business Information Systems in Melbourne. We also collaborated with a music composer and a music producer.

Participants begin their game development with an ideation session, which is guided by IDEO's design thinking, which encourages empathy, integrative thinking, optimism, experimentation, and collaboration (Brown, 2008). Design thinking is a human-centred approach, where designers can work closely with their end-users in developing solutions to problems (IDEO, 2015). I have chosen the design thinking approach because I'd like to work closely with my participants to co-create video games about their lived experiences of depression and anxiety. During the game jam workshops, the participants will be encouraged to share as many ideas as possible, defer judgment, and build on each other's ideas (Brown & Wyatt, 2010). The

ideas are discussed and sorted as a group to develop the design for their games.

We had our ideation session online using Microsoft Teams, which lasted 3 hours. Participants were presented with the themes and excerpts from the interview transcripts on the website (see Figure 4). The word cloud was very helpful for the participants to see all the codes at one time.

We used a Trello Board to organise our game ideas. Participants can add cards (like post-it notes) to different sections, such as “Game Mechanics”, “Narrative”, “Art Style”, “Music” and “Other Ideas” (see Figure 5). For the brainstorming, we had 6-minute bursts, to add as many ideas as possible to any of the lists. Following IDEO’s brainstorming guidelines, participants were advised that there are no such thing as bad ideas, and they were also encouraged to build on each other’s ideas. After each burst, we had a discussion to talk about all the ideas added and participants were also able to share their lived experiences.



Figure 5: Screenshot of Trello for Game Jam

## Game development workshops

During the game jam workshop, I also introduced the participants to the game development tools that will be used. The game is developed using Unity, which is a popular game engine for 2D and 3D game development.

We also used YarnSpinner, which is a plugin that allows writing game dialogue in plain language (see Figure 6).

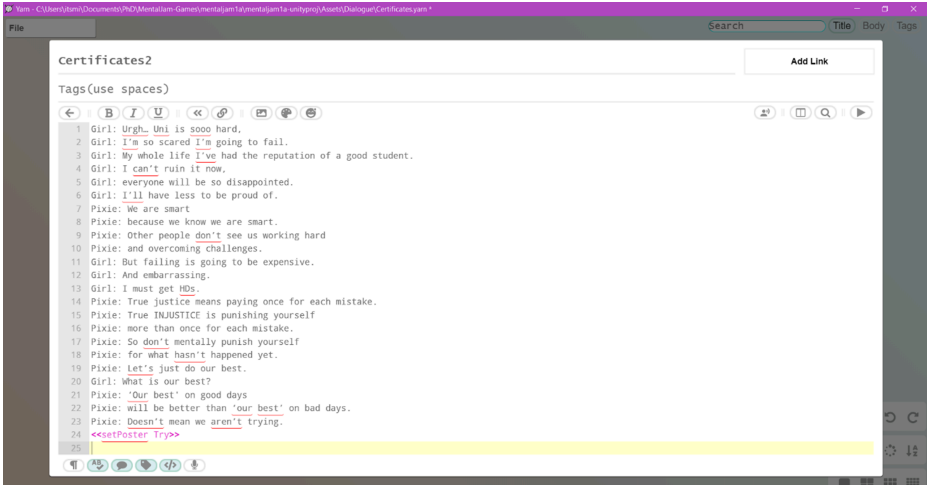


Figure 6: Screenshot of YarnSpinner

## Participants develop games in groups and release games

My participants work together to produce video games about their lived experiences of depression and anxiety during a game jam. Due to the current pandemic situation, the game jams were conducted online via Microsoft Teams once a week over the course of a month. Even though there is a suggested time frame for the game jam, the participants' time commitment is flexible; participants will not spend the whole time working on the games. Game jams are normally low stakes environments and flexible with each participant's time and commitment.

After our ideation session, we divided the tasks. We all worked on the game design and narrative and script for the game together. We had a 3-hour session, where we worked on the script as a group. While writing the script, we also had discussions and shared more lived experiences which were then incorporated into the narrative of the game. During the weekdays, I worked on the art and programming. We also collaborated with a composer and a music producer who worked on the background music as well as a theme song for the game. I also organised meetings

once a week during the weekend, where we discussed different aspects of the game, as well as presented any work we have accomplished during the week.

We developed a game called “Amour de Soi”, which was released online with the consent of the participants on itch.io, a website that allows independent game developers to host their games (<https://mentaljam.itch.io/love>).

### Interview participants about their game jam experience

---

At the end game jam workshops, I also conducted semi-structured interviews with the participants. The interviews have three purposes: 1) to evaluate the game jam workshop facilitation process, 2) to evaluate the participation outcomes of the game jam workshops, and 3) to evaluate the participants game development process. The interviews are also video recorded, transcribed, coded thematically to identify themes, and evaluated using thematic analysis (Braun & Clarke, 2006). The feedback from my participants will inform the next iteration of my game jam workshop process.

### OUTCOMES OF GAME JAM

---

Amour de Soi is a game that was developed over a month with participants about their lived experiences of depression and anxiety. It is an interactive narrative game about Raille San, an anxious girl who is on a journey to self-love following a break-up from a toxic relationship. She tends to overthink and be trapped in her own thoughts. She meets Pixie, a magical manifestation of her subconscious, who challenges her negative thoughts and offers some advice while teaching her how to love herself and accept herself for who she is.

The name of the character, Raille San, is a portmanteau of the nicknames of the game jam participants. While the title of the game, Amour de Soi is based on the concept of self-love by the philosopher Jean-Jacques Rousseau.

In the next three sections, we discuss the themes identified from the interviews and how they informed the design of the game. The narrative of the game was based on three main themes that were identified from the interviews: “Views about Causes of Depression and/or Anxiety”, “Experiencing Depression and/or Anxiety”, and “Recovery”.

### Views about Causes of Depression and/or Anxiety

---

Interview participants identified different reasons for the cause of their depression and/or anxiety. For three participants, they talked about their past relationships, which they described as toxic, emotionally and verbally abusive:

*I think it's toxic when your happiness is very dependent on one person. And when you one person giving you validation or attention has the ability to like, make or break your entire day. I think that is toxic. But because he was giving me attention. I was so so happy because I was getting attention from that one person (Natalie).*

Some participants talked about how they seek validation from their partners because they felt a bit insecure in their relationships and about their feelings. For one participant, her ex-boyfriend would also hide their relationship from his friends and family, which made the participant insecure, and she also felt that she was putting more effort into their relationship compared to her ex-boyfriend. Another participant cited multiple instances when her boyfriend was not there for her, even when she was sick and hospitalized, and her ex-boyfriend didn't reply to her messages and calls, before breaking up with her. While according to one participant, her ex-boyfriend was quite controlling. For one participant, their relationship also caused her to self-harm, while after their breakup one participant got hospitalized, and another participant started seeing a therapist.

At the start of the game, the main character, Raille, tries to text her boyfriend, but she isn't getting any replies until he ultimately sends a message to break up with her. The breakup led to her depressive episode, where she would lie in bed, cry, and not feel like doing anything (see Figure 7).



Figure 7: Screenshot from *Amour de Soi*, where Railla is depressed

Some participants felt out of place in school and at work because they were a minority, such as being the only woman in her team or being one of the very few people of colour in their company and school. One participant felt like he didn't fit in, because people in his school was very sports-oriented and he wasn't very good at sports. When one participant moved to a new school, where most students were from rich families, she felt that she couldn't keep up with their lifestyle, and they would make fun of her. Two participants talked about being LGBT+, and how they didn't feel safe in school. For one participant, she felt out of place at work because she was the only woman in her team and one of two Asians in her company, and "there was a lot of casual, sexist, racist, homophobic, transphobic language that was being used in the culture (Sarah)." Another participant also talked about feeling out of place because of their ethnicity:

*I always wished I was like East Asian. Like, I wish I wasn't Filipino. I didn't want to look the way I did. Because at least if I was Asian, I would be pale. I like would look more like the white kids... cuz like for me, I wasn't. I was just like, yeah, I'm friends with the Asian kids. I don't look like them. And it felt weird... I always kind of felt like I think it didn't help that like, looking back. A lot of it did come from like, I was out of place because I wasn't white. But even with the other Asian kids, I was like, not like them either... (Kim)*

For another participant, when she changed to a school, with more people from a similar background, she was able to connect with more people.

One of the participants, Natalie, suggested that for the game, instead of having players customize the character's look, such as the colour of her skin and hair, they are given a random colour wheel (see Figure 8), because as in real life, we do not get to decide our skin colour.



Figure 8: Screenshot from *Amour de Soi*, showing the random colour wheel

Some participants talked about how they set high expectations for themselves. For some participants, their parents put a lot of pressure on them as well to do well in school and get good grades. They also constantly seek validation from their parents:

*I didn't realize but I was a perfectionist, but not in the sense where it was like, Oh, I must get like high distinctions. I must get high scores. But it was in more small, trivial things where I need to get this specific thing, right. So let's say in essay writing, I struggled a lot because I wouldn't be able to write more than, let's say two sentences, because they didn't feel right to me. Like I like they should at least be decent. You know. And, also, I needed to be like a role model. I had to be there for my sister, which puts a lot of stress on my mind... And mostly because I got into the Select Entry school, everyone there was like a high achiever. And so there was also stress coming from there (Abigail).*



Another participant felt like her parents did not value what she was studying in university, because it was not a science, technology, engineering, or math (STEM) course. While one participant, Rachel, during the game jam workshop shared that her mother did not allow her to pursue music, so she studied Computer Science instead. It led to a people-pleasing tendency for one participant, where she cares about other people's opinions a lot. Another participant felt bad about disappointing people, especially her teachers when she was in school.

Another participant, Rachel suggested that the players should get to decide which aspect of Railla's life they can explore first. So, in the game, the players can decide which objects in Railla's room they like to select first to get to know more about her. One of the objects are certificates on the wall, if the player clicks on them, Railla will talk about how her parents have high expectations for her to do well in school. Another object is a laptop, which prompts Railla to talk about how she is currently studying Computer Science because that is what her mother chose for her, even though she wanted to pursue music. Another object is a microphone, which prompts Railla to talk about how singing also helped her cope with her anxiety. For the game, we collaborated with a composer and a music producer to produce a theme song for the game for Rachel to sing.

## Experiencing Depression and/or Anxiety

---

When experiencing depression and/or anxiety, some participants spent a lot of time sleeping and had self-destructive behaviours, such as neglecting self-care:

*It was that bad. Like, I couldn't get up. And I didn't want to move and I slept all day. And I was constantly tired. Like, it was at the point where like, every three days, my parents, or like, my older brother, who was still at home, or like, live close by, they used to be like, hey, you haven't showered in three days, you have to get up and do it. They'd have to like, make me so. Like, they weren't like forceful, but they will kind of get up now. You could go back to bed after this. Just please look after yourself even a little bit. Yeah, so it was really, it was a struggle, because I could barely just move. And I didn't want to see anyone (Kim).*

As mentioned before, in the game, during Raille's depressive episode, she is in bed and crying.

Participants also had negative thoughts when they were experiencing depression and/ or anxiety. For some participants, their anxiety usually starts with overthinking, some participants were hyperaware of their surroundings. Some participants questioned their purpose in life, especially during the lockdown, while another participant said he has nihilistic thoughts almost daily, thoughts about death and life after death.

For some participants, their anxiety starts with overthinking, and they would be stuck in a deadlock state. One participant said, "*our thoughts really do trap us* (Natalie)".

Most of the script in the game is Raille's internal monologue, representing her overthinking about the different aspects of her life, including her breakup, feeling out of place and high expectations.

## Recovery

---

Participants talked about their self-care and coping strategies (see Figure 4.10). For one participant, she would challenge her negative thoughts by imagining that she was talking to a friend:

*Questions to ask yourself when you're starting to spiral, for example, like, how would it be if this was happening to a friend? How would you react to it? And that, I guess, because I'm, I find myself and people with anxiety and depression usually are very self critical and have really high standards that they may or may not realize, and yeah, sort of thinking about it. If it happens to one of your friends can really help ground yourself, I guess, and challenge those negative thoughts... thinking about whether this was said or done by a friend how I'd react to that. So questioning my negative thoughts, and whether they're actually realistic or not? Um, I guess, being aware of like, how I think and that sort of patterns, and traps that I fall into often (Sarah)*

In the game, Raille meets a character named Pixie, who wakes her up from her depressive episode. Pixie represents her subconscious who challenges her negative thoughts and teaches her to love herself and accept herself for who she is (see Figure 9).



Figure 9: Screenshot from *Amour de Soi*, showing Pixie

A few participants also tried journaling, including writing what they are grateful for, however, some of them did not think it worked for them. Another participant also likes keeping a planner to keep track of their day.

*I like to journal which I haven't been getting into, because I feel like, when I was back at home, I had a lot of free time. And I would also journal and those help me like journaling really, really helped me and I don't journal about I just like, you know how you art journal, you just stick random scraps of paper together, put stickers together, not like writing about my day, just like creating something, thinking about it. Writing random words on paper, decorating it with stickers all around it, or scrap paper. That really helps (Natalie).*

Some participants found reading books quite helpful for their mental health, while other participants wish they could read more. They read self-help and motivational books. While another participant was inspired to join the game jam, after reading a series of books, who featured characters with mental illnesses. He finds the characters relatable, and it showed him that even if you suffer from mental illnesses, you can still be successful. During the game jam workshops, the participants also recommended books to each other.

Two participants also talked about how they watch Korean dramas as a

coping mechanism. One participant also mentioned how she would find role models from movies or TV shows and aspire to be like them:

*When I used to watch like movies or TV shows, I used to like, have a character that I really liked and I thought she was and then I used to look up to a strong character in like movies like TV shows. Also in real life. Oprah Winfrey was like a role model for a while. I used to watch her videos. wanted to be like her just basically having a goal and no need to reach that goal or reach. become this person that I want to become. And towards that focusing on that helped me not look at my past. So that really helped because I was looking into the future I was focusing forwards (Natalie).*

Journaling is also one of the coping mechanisms that Raille tries in the game. She also talks about how she likes to keep track of her tasks in a To-Do list and how it helps her focus. Raille also has a bookshelf in her room, and she talks about she likes to read motivational books and fantasy books. Raille also watches Korean dramas and she talks about how she aspires to be like one of the characters from *It's Okay Not to Be Okay*.

During the game jam workshop, the participants also shared other coping mechanisms, such as decluttering the photos of their ex-boyfriend, positive affirmations and skincare as self-care. Raille also has a wire grid on her wall, with polaroid photos of her ex-boyfriend, as well as a heart-shaped pillow that her ex-boyfriend gifted her. Pixie would give the Raille the option to remove the photos, if the player selected 'Yes', the photos and heart-shaped pillow will be removed from the room (compare Figure 7 and Figure 9). As Raille learns to love herself, she also unlocks affirmation stickers and posters that would appear in her room (see Figure 9). Pixie would also give Raille the option to put on a sheet mask as a form of skincare and self-care.

When asked what recovery is, while participants say that there might not be “*completely cured* (Sarah)”, it's equipping themselves with tools that they learned, while one participant also said that being able to enjoy the present moment.

*I think, for me, as of right now, being able to enjoy the moments that I'm experiencing. Because anxiety has made it really hard to do what I want comfortably, because there would always be a second thought*

*around me, there will always be I'll always be constantly worrying about something. By being able to talk through my counsellor being able to have my friends, I wanted to, to take things as it is, and just get to a point where I'm able to enjoy these moments (Abigail).*

At the end of the game, Railla leaves her room and goes outside to see fireworks light up the sky, representing how she is enjoying her present moment (see Figure 10). In this scene, the theme song that Rachel sang, is also being played.



Figure 10: Screenshot from *Amour de Soi*, showing ending scene

## CONCLUSION

---

Mental Jam provides a venue for people with lived experiences of depression and anxiety to share their stories, learn new skills and work together to develop video games. It also aims to contribute to the field of arts-based knowledge translation, as well as expand game design perspectives for empathy games.

It was the first time for both participants to join a game jam, while Rachel have made games before while she was doing her Computer Science degree. For Rachel, she felt that this game jam experience allowed her to be more creative, such as she was able to suggest the art style for

the game, and she also got to sing the theme song. While Natalie had an impression that game development would be hard and unachievable for her. But through the game jam workshops, she realized that working with the group, where everyone contributed different skills and expertise to develop the game, was very rewarding for her and gave her a lot of confidence.

Natalie also felt that the game jam workshops were a safe space for her to share her stories. Both participants expanded more on their lived experiences during the game jam workshops compared to their interviews. Especially when we were working on the script of the game together, participants were able to incorporate their lived experiences into the composite character, Raille. Natalie felt that the game represented her story well. Rachel also found the experience very personal because she was able to share her experiences with anxiety and depression, and for the game to potentially help other people going through the same thing. Natalie felt very proud seeing the final game output because it was something tangible, she also let her family play the game.

The positive and promising feedback from the participants of the game jam showed the game jam workshop as a viable method for developing video games about the lived experiences of depression and anxiety. The benefit of the game jam workshop and working in teams is that participants do not need to have all the skills required to develop a game. The participants also found a venue to reflect and share their lived experiences of depression and anxiety.

## REFERENCES

---

- Bayrak, A. T. (2017). Jamming as a design approach. Power of jamming for creative iteration. *Design for Next 12th EAD Conference*. Sapienza University of Rome.
- Bergold, J., & Thomas, S. (2012). Participatory Research Methods: A Methodological Approach in Motion. *Forum for Qualitative Social Research*. <http://www.qualitativeresearch.net/index.php/fqs/article/view/1801/3334>

- Braun & Clarke. (2006). Using thematic analysis in psychology, *Qualitative Research in Psychology*, 3(2), 77-101, DOI: 10.1191/1478088706qp063oa
- Brown, T. (2008). Design Thinking. *Harvard business review* 86(6):84-92, 141
- Brown, T. & Wyatt, J. (2010). Design Thinking for Social Innovation. *Stanford Social Innovation Review*, 8(1), 30-35.
- Caballero, V. (2014). *Empathetic Games Are Here to Stay! What's Next?* <https://www.gdcvault.com/play/1020598/Empathetic-Games-Are-Here-to>
- Canadian Institute of Health Research (2000). *Knowledge translation strategy*.
- Caron-Flinterman, J.F., Broerse, J.E.W. & Bunders, J.F.G. (2005). The experiential knowledge of patients: a new resource for biomedical research? *Social Science & Medicine*. 60.
- Deen, M., Cercos, R., Chatman, A., et. al. (2014) Game jam: [4 research]. ACM Press, pp 25–28
- Evans, M. & Foster, S. (2009) Representation in participatory video: Some considerations from research with Métis in British Columbia. *Journal of Canadian Studies/Revue d'études Canadiennes* 43(1), 87–108.
- Faas, T., Liu, I., Dombrowski, L. & Miller, A.D. (2019). Jam Today, Jam Tomorrow: Learning in Online Game Jams. In *Proceedings of the ACM on Human-Computer Interaction*, Vol. 3, No. GROUP, Article 240, December 2019. ACM, New York, NY, USA. 27 pages. <https://doi.org/10.1145/3361121>
- Fals-Borda, O., & Rahman, M. A. (1991). *Action and knowledge: Breaking the monopoly with participatory action research*. Apex.
- Foltz, A., Williams, C., Gerson, S.A., Reynolds, D.J., Pogoda, S., Begum, T. & Walton, S.P. (2019). Game Developers' Approaches to Communicating Climate Change. *Front. Commun.* 4(28). doi: 10.3389/fcomm.2019.00028
- Fricker, M. (2013). Epistemic justice as a condition of political freedom? *Synthese*, 190(7), 1317–1332. <https://doi.org/10.1007/s11229-012-0227-3>

- Global Game Jam (2020). *Global Game Jam® History*. <https://globalgamejam.org/history>
- Goldner, E., Jeffries, V, Bilsker, D., Jenkins, E., Menear, M. & Petermann, L. (2011). Knowledge Translation in *Mental Health: A Scoping Review*. *Healthc Policy*. 7(2), 83-98.
- Groot, B., Haveman, A. & Abma, T. (2020). Relational, ethically sound co-production in mental health care research: epistemic injustice and the need for an ethics of care, *Critical Public Health*, doi: 10.1080/09581596.2020.1770694
- Ho, X. (2017). Evoking Inspiration for Game Jam Ideas. *ICGJ*, February 26 2017, San Francisco, CA, USA.
- Hoffman, K. (2017). Social and Cognitive Affordances of Two Depression-Themed Games. *Games and Culture*, 14(7-8) 875-895.
- IDEO (2015). The Field Guide to Human-Centered Design.
- Kultima, A. (2015). Defining Game Jam. *Proceedings of the 10th International Conference on the Foundations of Digital Games (FDG 2015)*, June 22-25.
- Kultima, A. (2019). Superjammers: Motivations and Experiences of Exceptional Game Jammers in Finland. *ICGJ 2019*, March 17, 2019, San Francisco, CA, USA.
- Locke, R., Parker, L., Galloway, D. & Sloan, R. (2015). The Game Jam Movement: Disruption, Performance and Artwork. *Proceedings of the 10th International Conference on the Foundations of Digital Games*.
- Loebach, J., Tilleczek, K., Chaisson, B. & Sharp, B. (2019). Keyboard warriors? Visualising technology and well-being with, for and by indigenous youth through digital stories, *Visual Studies*, 34 (3), 281-297, DOI: 10.1080/1472586X.2019.1691050
- Lomax, H., Fink, J., Singh, N. et al. (2011) The politics of performance: Methodological challenges of researching children's experiences of childhood through the lens of participatory video. *International Journal of Social Research Methodology* 14(3), 231-243.



- Ludum Dare (2020). *Ludum Dare 46 Statistics*. <https://ldjam.com/events/ludum-dare/46/stats>
- Pablos-Mendez, A. & Shademani, R. (2006). Knowledge Translation in Global Health. *The Journal of Continuing Education in the Health Professions*, 26, 81–86.
- Reng, L., Schoenau-Fog, H., Kofoed, L.B. (2013). The motivational power of game communities-engaged through game jamming. *Proceedings of the 8th International Conference on the Foundations of Digital Games*.
- Rose, D. & Kalathil, J. (2019). Power, Privilege and Knowledge: the Untenable Promise of Co-production in Mental “Health”. *Front. Sociol.* 4,57. doi: 10.3389/fsoc.2019.00057
- Rusch, D. (2012). “Elude”: designing depression. *Proceedings of the International Conference on the Foundations of Digital Games*, 254–257.
- Rusch, D. (2017). *Making Deep Games: Designing Games with Meaning and Purpose*. CRC Press.
- Smith, L., Bratini, L., Chambers, D., Jensen, R.V. & Romero, L. (2010). Between idealism and reality: Meeting the challenges of participatory action research. *Action Research* 8(4), 407–425.
- Solberg, D. (2016). *The problem with empathy games*. <https://killscreen.com/articles/the-problem-with-empathy-games>
- Tilleczek, K. (2016). *Voices from the Margins*. EdCan Network. <https://www.edcan.ca/articles/voices-from-the-margins/>
- Tilleczek, K., & Loebach, J. (2015). Research goes to the cinema: The veracity of videography with, for and by youth. *Research in Comparative and International Education*, 10(3), 354–366.
- Thomas, L. & Owen, C. (2013). Living the indie life: Mapping creative teams in a 48 hour game jam and playing with data. *Proceedings of The 9th Australasian Conference on Interactive Entertainment: Matters of Life and Death*, 15.

Turner, J. & Thomas, L. (2020). (co)Curating game jams for community and communitas A 48hr game making challenge retrospective. In *International Conference on Game Jams, Hackathons and Game Creation Events 2020 (ICGJ20)*, August 24, 2020, Osaka, Japan. ACM, New York, NY, USA. <https://doi.org/10.1145/3409456.3409457>

Turner, J., Thomas, L., & Owen, C. (2013). Living the indie life: mapping creative teams in a 48 hour game jam and playing with data. *IE2013*. Melbourne, Australia.

World Health Organization (2005). *Knowledge management and health: News and events*.

WZO Games (2013). *Actual Sunlight* [Video Game]

Vollman, A. R., Anderson, E. T. & McFarlane, J. (2004). *Canadian Community as partner*. Lippincott Williams & Wilkins.



# *A qualitative interview study of stakeholder use of Vaxcards in schools*

DANIEL STEWART EPSTEIN, MELIS SELAMOĞLU & CHRISTOPHER BARTON

## ABSTRACT

### **Background**

---

There are few age-appropriate tools to address vaccine hesitancy among young people. Therefore, we conducted a pragmatic, randomised controlled trial of Vaxcards, a collectable card game, to incentivise the return of consent forms for vaccination and educate young people about vaccination. This paper describes stakeholder experiences and reflections using Vaxcards within the trial as part of a routine school vaccination program for year seven students in 2019.

### **Methods**

---

Descriptive, qualitative interviews were undertaken with stakeholders from six schools participating in the intervention arm of the trial. Interviews were audio-recorded, transcribed verbatim and analysed for emerging themes.

## Results

---

Stakeholders described positive experiences using Vaxcards as a tool to support vaccine consent procedures and deliver vaccine education, although some perceived it as being more useful for younger adolescents and those attending mainstream schools. Stakeholders reported that Vaxcards generated conversations around vaccine importance and safety and could be further incorporated into the health curriculum. The intervention was not perceived as burdensome although, some schools faced challenges adhering to the study protocol and competing demands challenged completion of all study elements.

## Discussion

---

A pragmatic understanding of how Vaxcards were used and perceived within schools during the trial provides critical insights to support future studies and scale-up of the intervention. Stakeholders supported the use of Vaxcards in schools, believed it to be a viable tool to support education about vaccines in conjunction with the vaccination program. In addition, alignment with government vaccine materials and incorporation into school curriculum could further enhance Vaxcards to support the vaccination of adolescents in school settings.

## BACKGROUND

---

Adolescents, who receive vaccinations in Australian secondary schools, are considerably vaccine-hesitant (Epstein et al., 2021). Earlier work from our group found that 67% of students considered vaccines adequate, 70% considered vaccines safe, while just 79% considered them important (Epstein et al., 2021).

Vaccine confidence is a barrier to vaccination in Australia (Salmon et al., 2006; Telebriefing, 2013) but the challenge of seeking and gaining consent from caregivers is another primary concern in school-based vaccination programs. For example, vaccination of eligible children within schools in Australia requires the distribution and return of a consent form from caregivers in order for children to participate in vaccination programmes at

their schools. Therefore, the return of consent cards is a limiting factor in the timely delivery of vaccines in this age group (Rockliffe et al., 2018).

### **Games as a tool**

Games – activities that one engages in for amusement or fun – have an inherent ability to elicit our interest, engagement and motivation more so than static educational material without implicit rules, objectives and pursuits (Deater-Deckard et al., 2013). Games can leverage the underlying psychology of rewards, social norms, mastery, autonomy, and the pursuit of meaning to achieve desired choices and behaviours (Boyle et al., 2011; Gobet et al., 2004). Gamification describes the purposeful design and application of game-like elements into non-game environments. Although a broad term, the core principle is taking design elements from games or play to influence choices and behaviour (King et al., 2013). For a game to capture one's attention and change behaviour, it must be carefully designed with a clear goal and consider numerous approaches through multiple lenses (Schell, 2008). Without a thoughtful design process, gamifying something can render it ineffective or annoying, potentially deterring the desired behaviour or promoting undesired outcomes such as cheating or stealing, and in extreme cases being dangerous or unethical (Takahashi, 2004; Zagal et al., 2013). Collectables and gamification are essential educational tools to help children engage with learning, generate discussion, and provide an incentive to engage with the content being delivered (Kiryakova et al., 2014). This medium of education increases motivation and engagement (Kiryakova et al., 2014). Theoretically, when applied to the delivery of vaccine education, one might expect this to impact confidence towards vaccination.

### **Tabletop, card and physical games.**

In modern times, physical, card and tabletop games may be considered unsophisticated or outdated and are often overlooked when gamification interventions are considered in favour of contemporary alternatives such as digital or video-based products. However, since tabletop games are cheaper to produce and arguably easier to design whilst promoting an inclusive and social aspect to the gaming experience, they remain a viable

alternative for gamification for health behaviour change interventions (Xu et al., 2011).

To address these two issues, we conducted a trial to test the use of Vaxcards as an ethical, non-monetary incentive to support school vaccination programmes for secondary school students.



Image 1: Example of Vaxcards game cards

The trial's objective was to determine if the return of consent form for vaccination improved when the card game was offered as an incentive. Seven schools within a single local government area in Victoria were randomised to receive the gaming cards to distribute to students upon returning their vaccine consent form.

The staff member responsible for the vaccination program coordination at each school coordinated the intervention within the school. This role varied by school and included staff whose primary roles included school nurse, year level coordinator, Vice Principal, Principal, student wellbeing officer or health subject teacher. It is well known that local champions within organisations provide momentum for interventions in schools. (Bartlett et al., 2017; Epstein et al., 2021b). Therefore, these staff members were considered critical stakeholders for using the tool and justify their selection for an interview as a stakeholder.

After the trial was completed, we invited school representatives to participate in a brief qualitative interview to describe their experience using

Vaxcards in their school and viability for use in future immunisation activities. In addition, we wanted to understand the overall sentiment towards Vaxcards and ways the cards could be utilised in future studies to support vaccination in school settings.

## METHODS

---

Stakeholders in schools participating in the experimental arm of the trial were recruited to participate in a short, descriptive qualitative interview study. We took a pragmatic approach (Teddlie & Tashakkori, 2009) to the study's design and conduct, which aimed to collect reflections from stakeholders on the intervention, barriers and opportunities on the use of Vaxcards in school settings for future trials. The rationale for selecting a qualitative descriptive design is the importance of gaining insights into a poorly understood or exploratory phenomenon (Kim et al., 2017). Short, qualitative interviews were held with participants and ranged in length from 3-6 minutes. The interviews were conducted by MS, a research assistant, under the supervision of lead author DE and experienced qualitative researcher CB. This author was not involved in the initial trial but had experience conducting qualitative interviews with key stakeholders in health promotion and policy settings.

### Recruitment and Data Collection

---

All schools that participated in the experimental arm of the trial received an invitation to participate in interviews. Eight responses were received, and six participants were available for interview during the data collection period.

A semi-structured interview schedule was used to guide the interviews. Interviews were conducted by phone in February 2020, before the introduction of COVID-19 health measures. The interview sought insights into stakeholders' overall expectations, understandings of the practicalities, feasibility and barriers of implementing Vaxcards during the trial, any challenges encountered, and how the cards might be used in future vaccination programs. In addition, during the trial, the lead author kept a reflective research journal that included detailed field notes and



reflections on interactions with stakeholders and issues that arose during the pragmatic trial, including deviations from the study protocol. This was documented in the field notes of DE. For example, when collecting the trial survey responses, one school had used the Vaxcards, not as a reward for returning the consent cards but handed out all of them at the start.

All interviews were digitally recorded and transcribed verbatim shortly after completion of the interview by the interviewer and reviewed by the authors. Participants were provided with the opportunity to make corrections or expand upon discussion within the transcripts, but the study team received no corrections or further information.

The audio was listened to, and transcripts were read and re-read by all study authors. The lead author used QSR NVivo for data management and to support the coding of the transcripts. First, inductive, descriptive analysis of the transcripts was undertaken following the approach described by Minichello (2008). First, transcripts were read and re-read, developing a list of codes, and then condensed into themes. Next, coding was developed by the lead author and discussed critically between the study team until a final coding structure, and a description of themes was finalised.

The trial was registered with the Australian Clinical Trials Register (ACTRN12618001753246) and granted ethics approval from Monash University Human Research Ethics Committee and Victoria's Department of Education.

## RESULTS

---

All stakeholders interviewed were designated as their school vaccine program coordinator or directly involved in distributing and collecting vaccination consent forms and organising school vaccination logistics. Regarding the characteristics of the participants interviewed, most were women (60%). All worked in schools in the regional Local Government Area of Casey on the outskirts of metropolitan Melbourne, in a fast-growing local government area with a high level of sociocultural heterogeneity and a large migrant community. Details of the schools involved and outcomes

of the pragmatic trial have been published previously (Epstein et al., 2021; Epstein et al., 2021b).

| Name  | Description  |
|---|--|
| <b>Positive sentiment as a tool</b>           |  |
| Collection mechanic at work                   | Use of Vaxcards as an incentive at work for vaccine consent form collection        |
| Positive sentiment as a learning tool         | Vaxcards are used effectively in the classroom to discuss the topic of vaccination |
| Student active engagement                     | Classroom or playground engagement in-game   |
| <b>Timing and familiarity recommendations</b> |  |
| Local processes issues                        | Requests to receive cards alongside other council forms                            |
| Timing difference                             | Request to receive cards earlier   |
| Unfamiliarity                                 | Request to receive more information with cards                                     |
| <b>Viable and non-burdensome</b>              |  |
| The low burden on school                      | Mostly seen as a low burden for stakeholders                                       |
| Curriculum fit                                | Seen as a positive addition to health and science learning                         |
| Future viability positive sentiment           | Stakeholders overwhelmingly felt Vaxcards a viable tool                            |

*Table 1: Description of nodes and emerging themes*

Overall, Vaxcards in this setting was seen as a positive tool that could encourage student participation in vaccination discussions with teachers and each other. In addition, the introduction of the cards could provide a trigger for teachers to talk about vaccination and the importance of returning the consent form for future vaccinations.

“It was cool to see them [students] playing with them or using them [Vaxcards]. After they received their vaccination, they had to sit for 15 minutes, and because we got an extra Vaxcard, I think it was the HPV one we were giving them [Vaxcards] out after they had their vaccination. It was cool to see the kids sitting there, and they would carry the other ones on them and be like discussing them and playing with them [Vaxcards]. Cool stuff.” - P3

“The teachers (and) I had a really positive response ... they [students] thought it was really fantastic, and they [students] were able to start the conversation in their health classes.”-P3

In the context of this trial, the cards were intended to be used as an incentive to encourage children to return the consent form for vaccination. However, there were mixed expectations about this, which was driven by the characteristics of families attending the school. For example, one school that had a high proportion of families with intellectual disabilities did not expect the cards would be as helpful in this context, while others had populations with high vaccine hesitancy for whom teachers felt the students would “get more of an idea of those vaccinations from the cards which would help them”. -P4

“I think it is a good idea, but I think by year 7’s, there will be kids that probably are not immunised, and that is parents’ choices. Not much we can do with that. I think they are a good learning tool [Vaxcards] if they are used correctly.” =P1

“Well, I knew that probably parents would not participate in this study. I was not expecting great replies from it.... they probably would have been [better] for a mainstream school but probably not for ours”=P5

Some schools had a sense that there was a quicker return of consent forms, although the cards were perceived as probably being at the upper end of the age range for this type of intervention. They described that

several students were interested in card swap games. However, others had no interest in this type of game.

"I did not have a lot of expectations, but I suppose I hoped that they would encourage our students to return their immunisation cards."-P3

"We found that we did get a quicker return rate of the cards [consent forms] because the students knew they were getting something when they returned them [Vaxcards], even if they were not getting their immunisation. Whereas quite often, if they were not getting their immunisation, we would not get the cards [consent forms] back."-P3

### Viability for use in school settings

---

Stakeholders felt that the provision of Vaxcards did not add undue burden to the processes for vaccination within each school, and overall, this was a viable tool that could continue to be used to support consent card returns and vaccine discussions. However, it was not suited to all school settings.

There were requests to have the cards given to the school earlier in the school year and vaccine materials from the council for distribution to students and use in classroom activities. It was suggested that incorporating Vaxcards into Health, PE, or Science curriculum could add value to these areas.

"We received them [Vaxcards] too late. They should have gone out with our [consent form] cards, but our immunisation [consent form] cards had already gone out. I think if we had the Vaxcards earlier and the information for the parents, it might have been a bit better."-P6

"...it would be great to be able to have that as part of their curriculum [PE/ Health] that they offer the students. And because they tend to design the curriculum the year beforehand, it is something that needs to be out early. Even I suppose, in the science department as well because it sort of aligns in with that." -P3

## DISCUSSION

---

Testing a complex intervention in a pragmatic, real-world setting requires investigation and understanding of insights from stakeholders. With inquiry, it can be more fully understood, improved and identify key flexion

points in successful delivery and implementation of the intervention. In this pragmatic trial of Vaxcards, stakeholders showed interest in the tool, ease of use and positive sentiment from the school stakeholders and, more importantly, interactions with the children who received Vaxcards. The utility of this intervention as both an incentive (reward) and educational tool that can be incorporated into vaccination processes within schools with little additional burden provides an initial indicator of the viability of Vaxcards for use in the school setting. However, additional research is needed to maximise the usefulness and effectiveness of this intervention.

Some schools entered the study with low expectations, based on the characteristics of students at the school, such as special needs students and those high perceived vaccine hesitancy amongst families. However, the complexity of gameplay can be adjusted based on literacy and numeracy skills or the age of the participants. In addition, it could be argued from an ethical point of view that students with learning difficulties should be exposed to these concepts as part of their learning about health, and Vaxcards may assist this.

The statistical analysis of trial data did not identify quantitative improvements between the control and experimental groups in return for consent forms (Epstein et al., 2021; Epstein et al., 2021b). However, the qualitative experience from the stakeholders interviewed provides clues as to how the future use of Vaxcards can be modified to increase the efficacy of this intervention.

The intervention study had two components; the collection mechanic to incentivise return of vaccine consent cards and the educational component of the cards and gameplay to stimulate discussion about vaccine-preventable diseases and how immunisation protects against them. The timing and intensity of the intervention had limitations. Further trials of Vaxcards might be multimodal in their approach, integrating with health curriculum and aligning better with the timing of council and school programs. The timing of the intervention was in part constrained by council timelines and differences between schools in processes and timelines. Competing demands within schools was a further challenge to the completion of the study by protocol.

The qualitative interviews provide critical insights into the use of Vaxcards in a school setting within the context of a trial, albeit a pragmatic trial. Interviews and data collected were brief so as not to burden busy stakeholders and risk withdrawal from the trial. The interviews were conducted several months after completion of the trial, and stakeholders had differing degrees of involvement in vaccination programs within the school and, indeed, in their interactions with the study team throughout the trial. Furthermore, the interviews were conducted at a challenging time of the school year, which impacted the availability of stakeholders to participate in these interviews. Finally, interviews were conducted by a research assistant not involved in the initial trial, which may have led to some loss of context. However, this provided advantages in achieving a more independent appraisal of the challenges encountered during the trial.

## CONCLUSION

---

Overall, stakeholders perceived the Vaxcards trial positively, although they concede that it may not be suitable in all school settings. The findings do not tell us a great deal about Vaxcards as an incentive. However, we are encouraged about the ability of Vaxcards to support conversations about vaccine-preventable disease and immunisation in the classroom. The distribution of Vaxcards in this context was not seen as a burden. However, earlier provision of the cards and integration into other curriculum areas are strategies that should be explored in future trials.

## REFERENCES

---

- Bartlett, R., Wright, T., Olarinde, T., Holmes, T., Beamon, E. R., & Wallace, D. (2017). Schools as Sites for Recruiting Participants and Implementing Research. *Journal of community health nursing*, 34(2), 80-88. doi:10.1080/07370016.2017.1304146
- Boyle, E., Connolly, T. M., & Hainey, T. (2011). The role of psychology in understanding the impact of computer games. *Entertainment Computing*, 2(2), 69-74.

- Deater-Deckard, K., Chang, M., & Evans, M. E. (2013). Engagement states and learning from educational games. *New directions for child and adolescent development*, 2013(139), 21-30.
- Epstein, D., Enticott, J., Larson, H., & Barton, C. (2021). A pragmatic cluster randomised control trial using Vaxcards as an age-appropriate tool to incentivise and educate school students about vaccination. *BMJ Open*, 11(9), e049562. doi:10.1136/BMJopen-2021-049562
- Epstein, D. S., Enticott, J. C., Larson, H. J., & Barton, C. (2021b). Recruiting for research on sensitive topics in schools: an experience with Vaxcards, a collectable vaccine card game. *Trials*, 22(1), 320. doi:10.1186/s13063-021-05288-4
- Gobet, F., Retschitzki, J., & de Voogt, A. (2004). *Moves in mind: The psychology of board games*: Psychology Press.
- Kim, H., Sefcik, J. S., & Bradway, C. (2017). Characteristics of qualitative descriptive studies: A systematic review. *Research in nursing & health*, 40(1), 23-42.
- King, D., Greaves, F., Exeter, C., & Darzi, A. (2013). *'Gamification': Influencing health behaviours with games*. SAGE Publications.
- Kiryakova, G., Angelova, N., & Yordanova, L. (2014). Gamification in education. *9th International Balkan Education and Science Conference*.
- Minichello V, A. R., & Hays T. (2008). *In-depth interviewing* (3rd ed.). Pearson Education Australia.
- Rockliffe, L., McBride, E., Heffernan, C., & Forster, A. S. (2018). Factors Affecting Delivery of the HPV Vaccination: A Focus Group Study With NHS School-Aged Vaccination Teams in London. *The Journal of School Nursing*, 1059840518792078.
- Salmon, D. A., Teret, S. P., MacIntyre, C. R., Salisbury, D., Burgess, M. A., & Halsey, N. A. (2006). Compulsory vaccination and conscientious or philosophical exemptions: past, present, and future. *The Lancet*, 367(9508), 436-442.



Schell, J. (2008). *The Art of Game Design: A book of lenses*. CRC press.

Takahashi, D. (2004). Ethics of game design. *Game Developer*, 1, 14-19.

Teddlie, C., & Tashakkori, A. (2009). *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioral sciences*. Sage.

Telebriefing, C. (2013). National immunisation survey, vaccine for children program, and recent measles outbreaks in the U.S. press briefing transcript. Retrieved from National immunisation survey, vaccine for children program, and recent measles outbreaks in the U.S. press briefing transcript

Xu, Y., Barba, E., Radu, I., Gandy, M., & MacIntyre, B. (2011). Chores Are Fun: Understanding Social Play in Board Games for Digital Tabletop Game Design. *Paper presented at the DiGRA Conference*.

Zagal, J. P., Björk, S., & Lewis, C. (2013). Dark patterns in the design of games. *Paper presented at the Foundations of Digital Games 2013*.

## *About the ETC Press*

The ETC Press was founded in 2005 under the direction of Dr. Drew Davidson, the Director of Carnegie Mellon University's Entertainment Technology Center (ETC), as an open access, digital-first publishing house.

What does all that mean?

The ETC Press publishes three types of work: peer-reviewed work (research-based books, textbooks, academic journals, conference proceedings), general audience work (trade nonfiction, singles, Well Played singles), and research and white papers

The common tie for all of these is a focus on issues related to entertainment technologies as they are applied across a variety of fields.

Our authors come from a range of backgrounds. Some are traditional academics. Some are practitioners. And some work in between. What ties them all together is their ability to write about the impact of emerging technologies and its significance in society.

To distinguish our books, the ETC Press has five imprints:

- **ETC Press:** our traditional academic and peer-reviewed publications;
- **ETC Press: Single:** our short “why it matters” books that are roughly 8,000-25,000 words;
- **ETC Press: Signature:** our special projects, trade books, and other curated works that exemplify the best work being done;

- **ETC Press: Report:** our white papers and reports produced by practitioners or academic researchers working in conjunction with partners; and
- **ETC Press: Student:** our work with undergraduate and graduate students

In keeping with that mission, the ETC Press uses emerging technologies to design all of our books and Lulu, an on-demand publisher, to distribute our e-books and print books through all the major retail chains, such as Amazon, Barnes & Noble, Kobo, and Apple, and we work with The Game Crafter to produce tabletop games.

We don't carry an inventory ourselves. Instead, each print book is created when somebody buys a copy.

Since the ETC Press is an open-access publisher, every book, journal, and proceeding is available as a free download. We're most interested in the sharing and spreading of ideas. We also have an agreement with the Association for Computing Machinery (ACM) to list ETC Press publications in the ACM Digital Library.

Authors retain ownership of their intellectual property. We release all of our books, journals, and proceedings under one of two Creative Commons licenses:

- **Attribution-NoDerivativeWorks-NonCommercial:** This license allows for published works to remain intact, but versions can be created; or
- **Attribution-NonCommercial-ShareAlike:** This license allows for authors to retain editorial control of their creations while also encouraging readers to collaboratively rewrite content.

This is definitely an experiment in the notion of publishing, and we invite people to participate. We are exploring what it means to "publish" across multiple media and multiple versions. We believe this is the future of publication, bridging virtual and physical media with fluid versions of publications as well as enabling the creative blurring of what constitutes reading and writing.