

Institution: University of Cambridge		
Unit of Assessment: 4		
Title of case study: Hellblade: the award-winning computer game challenging stigma of psychosis and mental illness		
Period when the underpinning research was undertaken: Jun 2006 - Oct 2018		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s): Professor Paul Fletcher	Role(s) (e.g. job title): Bernard Wolfe Professor of Health Neuroscience	Period(s) employed by submitting HEI: 1999-Present
Period when the claimed impact occurred: 2014-present		
Is this case study continued from a case study submitted in 2014? N		
1. Summary of the impact (indicative maximum 100 words) <p>About 1 in every 100 people will experience a psychotic episode in their lifetime (Mental Health UK). First episodes often occur when a person is in their late teens or early twenties. Professor Fletcher's research at the University of Cambridge has provided an explanation for psychosis based on subtle shifts in information processing. In a collaborative project with the games company Ninja Theory, Professor Fletcher's expertise was used to inform the development of the computer game Hellblade: Senua's Sacrifice, in which the lead character experiences psychosis. Hellblade has had enormous commercial and critical success, with over 1.5 million games sold in 18 languages to over 20 countries worldwide. The game also won over 67 awards, including 5 BAFTAs, and a 'Game for Impact' award for its 'profound social messages'. Offering a visible and experiential portrayal of otherwise invisible mental illness, it has helped challenge the stigma surrounding psychosis.</p>		
2. Underpinning research (indicative maximum 500 words) <p>Psychosis entails a powerful change in how a person experiences and comprehends reality and is associated with isolation and stigma. In the general population, first episode psychosis occurs most commonly between late teens or early twenties, with more than three quarters of men and two thirds of women experiencing their first episode before the age of 35 (Psychosis Data Report, Public Health England, 2016). However, many continue to avoid seeking treatment due to perceived stigma and discrimination.</p> <p>Understanding the mechanisms of psychosis</p> <p>Professor Fletcher's research at the University of Cambridge has sought to make sense of psychosis by relating it to the ways that, even in health, the human mind faces profound challenges in interacting with, and making sense of, our physical and social environment. Disruption in specific brain areas was associated with psychotic experiences through studies linking cognitive processes, brain activity and symptoms. This led to deeper understanding of the mechanisms of psychosis (1-7).</p> <p>Over the years, Fletcher and colleagues have produced a body of empirical and theoretical work showing that normal perceptions and beliefs entail a delicate balance between current sensory input and experience-dependent prediction (2,3,6) and have shown that psychosis is associated with a subtle shift in this balance (2,4,5).</p> <p>Critically, the researchers, in collaboration with colleagues in Cardiff (3, 6, 7), have developed a perspective on psychosis and on other symptoms of mental illness that does not see it as some incomprehensible brain dysfunction, but rather as an understandable and even rational response to relatively small-scale perturbations in brain interaction. As well as offering a new mechanistic understanding for such symptoms, the work aims to make it possible to</p>		

understand the nature of psychosis in ways that are readily communicable to patients and the community at large.

Authentic representations of psychosis in gaming

In June 2014, Professor Fletcher was approached via the Wellcome Trust by Ninja Theory Ltd., an independent games developer based in Cambridge, to act as the consultant on the development of their new game, *Hellblade: Senua's Sacrifice*. The lead character in the game, Senua, struggles with psychosis and they wanted to portray this realistically and respectfully. A central principle of the development of the game was that the storyline and character must be factually accurate and, furthermore, that the process must be underpinned by a deeper understanding of the cognitive neuroscience of psychosis in order to avoid a simplistic or superficial representation. Professor Fletcher's research and clinical work on how complex clinical phenomena may be understood in terms of altered predictive processing in the brain was central to developing the structure of the game. This included the auditory and visual experiences, the story and the mental challenges placed before the player. By combining these features within a cohesive framework of understanding, the player comes to grasp intuitively the nature of perception and belief, thus making the experience of perturbed perceptions more powerful and disturbing, and engendering a powerful sense of empathy.

Professor Fletcher introduced the game design team to people who had suffered psychosis, facilitating discussions to allow a high degree of influence on how the game was developed from the initial stages. Indeed, the game effectively used stimuli that were comparable to those used in Cambridge-led research (3,5,6,7). For example:

- Senua's experience of movement and visual and auditory perception, brought to life verbal descriptions of an array of symptoms in ways that took the player beyond textbook descriptions and experience vividly what these might be like. Players were encouraged to use headphones to experience the persistent, critical, hostile voices commenting on their movements and decisions and, in conjunction with visual perturbations and a powerful story, the overall effect was unsettling and memorable. This was central to providing an absorbing, respectful and non-stigmatised representation of mental suffering.
- Professor Fletcher's study (3,6,7) of how people in early stages of psychosis use their expectations to make sense of noisy, ambiguous images led to a recurring game mechanic in which the central character saw patterns and shapes in her surroundings some of which were illusory, some of which were meaningful to proceeding through the game. The ability, in people with psychosis, to recognise patterns that are not perceived by others is incorporated into Senua's character and is part of the game mechanics needed to solve individual puzzles.

Professor Fletcher's input led to a highly innovative and unusual gaming experience that conveyed a deeper understanding of psychosis and, at the same time, demonstrating how even non-psychotic people are continually constructing their world based on expectations and experiences.

3. References to the research (indicative maximum of six references)

- (1) Corlett PR, Honey GD, Aitken MR, Dickinson A, Shanks DR, Absalom AR, Lee M, Pomarol-Clotet E, Murray GK, McKenna PJ, Robbins TW, Bullmore ET, **Fletcher PC**. Frontal responses during learning predict vulnerability to the psychotogenic effects of ketamine: linking cognition, brain activity, and psychosis. *Arch Gen Psychiatry*. **2006** Jun;63(6):611-21. doi:10.1001/archpsyc.63.6.611*
- (2) Corlett PR, Murray GK, Honey GD, Aitken MR, Shanks DR, Robbins TW, Bullmore ET, Dickinson A, **Fletcher PC**. Disrupted prediction-error signal in psychosis: evidence for an associative account of delusions. *Brain*. **2007** Sep;130 (Pt 9):2387-400. Epub 2007 Aug 9. doi:10.1093/brain/awm173*
- (3) Teufel C, Subramaniam N, Dobler V, Perez J, Finnemann J, Mehta PR, Goodyer IM, **Fletcher PC**. Shift toward prior knowledge confers a perceptual advantage in early psychosis and psychosis-prone healthy individuals. *Proc Natl Acad Sci U S A*. **2015**

Oct 27;112(43):13401-6. doi: 10.1073/pnas.1503916112. Epub 2015 Oct 12. PubMed PMID: 26460044; PubMed Central PMCID: PMC4629373.*

- (4) Diederer KM, Ziauddeen H, Vestergaard MD, Spencer T, Schultz W, **Fletcher PC**. Dopamine Modulates Adaptive Prediction Error Coding in the Human Midbrain and Striatum. *J Neurosci*. **2017** Feb 15;37(7):1708-1720. doi: 10.1523/JNEUROSCI.1979-16.2016. PubMed PMID: 28202786; PubMed Central PMCID: PMC5320604.*
- (5) Griffin JD, **Fletcher PC**. Predictive Processing, Source Monitoring, and Psychosis. *Annu Rev Clin Psychol*. 2017 May 8;13:265-289. doi: 10.1146/annurev-clinpsy-032816-045145. Epub **2017** Mar 30. Review. PubMed PMID: 28375719; PubMed Central PMCID: PMC5424073.*
- (6) Teufel C, Dakin SC, **Fletcher PC**. Prior object-knowledge sharpens properties of early visual feature-detectors. *Sci Rep*. **2018** Jul 18;8(1):10853. doi: 10.1038/s41598-018-28845-5. PubMed PMID: 30022033; PubMed Central PMCID: PMC6051992.*
- (7) Davies DJ, Teufel C, **Fletcher PC**. Anomalous Perceptions and Beliefs Are Associated With Shifts Toward Different Types of Prior Knowledge in Perceptual Inference. *Schizophr Bull*. **2018** Oct 17;44(6):1245-1253. doi: 10.1093/schbul/sbx177. PubMed PMID: 29294128;.*

*These publications have been peer reviewed.

Key competitive funding

The theme of the research concerns the brain as a predictive organ, funding has been awarded to extend this work to further understanding of human decision-making under normal circumstances and in neuropsychiatric illness.

1. Wellcome Trust – Investigator Award (2018-2023)

“The cognitive neuroscience of over-eating: normative and clinical studies of goal-driven and stimulus-driven responses”. GBP1,500,053 (60 months)

2. Wellcome Senior Research Fellowship in Clinical Science – renewal (2012-2018)

“Complementary Studies of Learning and Motivation in Psychosis and Pathological Hyperphagia”. GBP998,974 (60 months)

4. Details of the impact (indicative maximum 750 words)

Professor Fletcher’s expertise was incorporated into *Hellblade*’s development, with Ninja Theory commenting ‘*What started out as our attempt to lean on experts in the field for research support, evolved into a full-fledged creative collaboration, where Paul’s expertise fed directly into the story, character and player experience*’ [A]. Professor Fletcher’s input into game development was key to the success of *Hellblade*, with Ninja Theory commenting: “*The success of Hellblade: Senua’s Sacrifice, by whichever measure - be it critical, commercial or social impact, simply would not have been possible without our collaboration with University of Cambridge*” [A]. The game’s unique representation of psychosis and far-reaching success has also helped challenge stigma of those mental illness, validated the experiences of those psychosis.

Commercial Impact

Hellblade had far-reaching, international commercial success. Since its release in 2017, 1.5 million units were sold in 18 languages to over 20 countries worldwide on PC, Xbox, PlayStation 4, Nintendo Switch and VR platforms to critical acclaim with an average metacritic score of 84. Ninja Theory Ltd’s total turnover in 2017-2018 was in excess of GBP16.8 million which was ‘higher than expected with the incredible success of *Hellblade*’. Sales spanning 2017-2019 generated a total income of approximately GBP30 million (based on 1.5 million units sold at an average GBP20 unit price) [B]. Dominic Matthews, Commercial Director at Ninja Theory stated “*Hellblade’s glowing reception led in part to Ninja Theory being acquired by Xbox Game Studios, securing the studio’s financial future and has allowed us to build a brand new studio in the heart of Cambridge*”. The acquisition was key to securing the

continued employment of 115 staff [B, C] and on December 12 2019, Ninja Theory announced Hellblade II, in continued collaboration with Professor Fletcher [D].

The acquisition also freed the studio from the constraints imposed by a highly competitive games market, allowing them to change their strategic direction. In October 2019, Ninja Theory embarked on a new ambitious project aimed towards exploring how game technology can be used to improve mental health. The Insight Project is a long-term collaboration with Professor Fletcher combining mental health research, wearable technologies and immersive game design to develop a videogame that is flexible to each individual's needs, promoting mental wellbeing and reducing mental suffering: *"This is a new kind of clinical science, one that recognises the need to move away from the laboratory and to harness the creative skills of game makers as well as the capacity of gameplay as a means to learn about and reframe our understanding of the world and ourselves"* [E].

Impact on patients and public understanding

Hellblade received remarkable press attention and a global interest within the gaming community and beyond. Within the first month of release, it was estimated to reach 135 million people on social media, which consequently created 5.5 million impressions on Twitter [F]. The game received many online reviews with uploaded game videos initiating discussion on mental illness. This in turn has sparked hundreds of thousands of additional reviews and comments, demonstrating the game's broad reaching impact. On October 10 2017, for World Mental Health Day, Hellblade sales raised over GBP 60,000 for mental health charity Rethink Mental Illness, with Rethink's manager of fundraising stating *'The donation is the equivalent of employing two of our full-time colleagues to answer calls...helping people newly diagnosed with mental illness get more information and support'* [G]

Importantly, many of those attracted to Ninja Theory video games are at an age where psychosis can have its initial impact, so these attributes of the game were reaching people with a potentially deep interest in the subject matter. The game's impact in representing a neglected and misunderstood form of mental illness has been unique. It has opened up widespread, mature and reflective conversations across social media with feedback from those who have suffered directly or indirectly from mental illness demonstrating increased understanding and compassion. Hellblade made a deep and significant impact on players and those around them, as evidenced by testimonials sent to Ninja Theory, including [H]:

validating experiences of psychosis: *'Since I was a baby, I have suffered violent abuse. I felt like I didn't belong in this world, I heard voices, saw numbers and letters in the world. I was harassed by my own reflection in a mirror. So strange to see this all in a videogame...Your game made me cry because it showed it was possible to understand me.'*

changing attitudes towards mental illness: *'I had a psychotic break several years ago. My brother never understood. I overheard him say he was ashamed of me. After this game he turned to me and said he was sorry. You got a message across that I never could.'*

empowering individuals by representing their illness as a warrior: *'...the mental health community became a little stronger when Senua joined. You have given us confidence to go out and fight the fight'*.

In May 2020 the game was also a feature of an episode of the BBC podcast 'This Game Changed my Life'. An article on the podcast describes the experience of Jim, a teenager with psychosis: *"I was locked-in," he says. "There are people to whom I'll say, 'If you want to understand what I feel or see, have a go on this.'" The game had such a deep impact on Jim that it gave him a way to talk about psychosis in a way he couldn't before. He wrote an article, for the games website Kotaku, detailing what the game meant to him and how it helped him make sense of his own psychotic episodes* [K].

Hellblade has been internationally recognised as unique in its ambition to exploit and demonstrate the power of interactive media winning over 67 awards, including [B, J]:

- 5 BAFTA awards in 2018, including a BAFTA in the newly established category of Game Beyond Entertainment for its exploration of mental illness.
- Game for Impact award at the Game Awards (Los Angeles 2017) for its 'profound social messages'.
- Psychiatric Communicator of the Year (2018) from the Royal College of Psychiatrists, shared with CPFT NHS Recovery College East for its 'candid and honest portrayal of mental illness, presenting psychosis in a first-person experience'

Award committees and media commented on its strengths in drawing together innovative audio visual approaches to representing experiences, based on in-depth neuroscientific and clinical analyses with a powerful and respectful storyline portraying the fear and bewilderment of psychosis and the courage, determination and dignity of its protagonist [F,J].

Impact on teaching

The success of the game led to Ninja Theory in 2018 to establish 'Senua's Scholarship' in partnership with the Cambridgeshire and Peterborough NHS Foundation Trust's Recovery College East's 'Head to Toe' charity. The scholarship allows one student each year to train with the organisation to become a mental health tutor – increasing capacity to support patient wellbeing and assisting people diagnosed with mental illness to discover the possibilities of "life beyond diagnosis". Although further recruitment to the programme has been affected by the COVID-19 pandemic, so far one scholar has been recruited and completed an internal tutor training programme and will also complete a Level 3 qualification in adult education[K].

5. Sources to corroborate the impact (indicative maximum of 10 references)

- Testimonial from Commercial Director at Ninja Theory
- Commercial impact: (i) Email from Ninja Theory: units sold and reach (ii) Companies House Annual Reports 2017-2018 (page 1),
- Business weekly article describing secured jobs, 13 June 2018 "*Microsoft acquisition of Ninja Theory secures 100 Cambridge jobs*".
- Hellblade II announcement (Twitter)
- Overview of The Insight Project
- Hellblade: Senua's Sacrifice Coverage Report, August 2017. Includes examples of press coverage and social media reach (The Times, The Sun, Metro, New Scientist, Wired, TechRadio).
- Rethink Mental Illness quote on funds raised: Take this.org "Hellblade fans and Ninja Theory donate to Mental Health Charity" 8 November 2017.
- Ninja Theory Hellblade: Senua' Sacrifice Accolades Trailer Available from Youtube: https://www.youtube.com/watch?v=-n7RTnRZ_QQ&has_verified=1
- BBC: "This Game Changed my Life: How Hellblade helped me cope with my psychosis" a feature on the podcast This Game Changed my Life episode "Jim: Flight, light or Freeze) 28 May 2020
- Hellblade Awards (i) BAFTA (ii) Game Awards (iii) Royal College of Psychiatrists (page 7)
- (i) Impact on teaching: Senua's Scholarship for mental health tutors (ii) correspondence with Recovery College East regarding Senua's Scholarship