The Insight Project

Could a videogame help promote mental wellbeing and reduce mental suffering?

Paul Fletcher

Psychiatrist & Professor of Health Neuroscience, University of Cambridge

Tameem Antoniades

Creative Director & founder, Ninja Theory

Summary Statement

The Insight Project is an experimental and exploratory project expected to take shape over several years but is being announced early to encourage an open and transparent approach to its development. The end goal is to deliver a mainstream solution to help treat mental suffering and encourage mental wellbeing.

Mental health problems are becoming increasingly frequent and, though many do not reach the severity that would bring them to the clinic, they entail a strong and pervasive degree of suffering and ill-health.

There is a growing realisation that mental experiences, including negative ones like fear and anxiety, which are central to mental ill-health, emerge from a complex interaction of biological, psychological and environmental factors. Any comprehensive approach to mental suffering must take into account these factors.

We believe that video games have huge potential to help people in ways that have yet to be explored and exploited. They provide compelling and absorbing narratives within immersive settings and can be tailored to respond flexibly and sensitively to the individual abilities and demands of those who play them.

Wearable technology has reached a stage where it can provide precise, sensitive, accurate measures of an individual's physical and physiological state.

Thus, the game setting, allied to wearable tech, has the core components to offer a realistic approach to measuring and – ultimately – shaping the factors that combine to produce mental suffering and ill-health.

We plan a programme of gaming, technological and scientific development that will lead to self-contained, individualised and absorbing game experiences, within which people can become expert at recognising, responding to and ultimately controlling their own unique patterns of physical and physiological signalling that are the driving force behind fear, anxiety and other negative subjective experience. The work will be underpinned by scientific principles to ensure its validity and it will adhere to strict standards of ethics and data management.

This approach will be widely and conveniently applicable, flexible to the needs of the individual and, critically, enjoyable and absorbing in ways that will ensure enthusiastic engagement leading to marked and sustainable change.

Background and Context

In 2017, Ninja Theory released *Hellblade: Senua's Sacrifice* on PlayStation and PC platforms and later to Nintendo Switch and VR. It was headed by Tameem Antoniades, co-founder and Creative Director at Ninja Theory under the guidance of Paul Fletcher, psychiatrist and Professor of Health Neuroscience at University of Cambridge.

Hellblade received universal acclaim for its depiction of a warrior with severe mental health issues with a focus on psychosis. It went on to win numerous awards including five BAFTA awards, three The Game Awards and a Royal Society of Psychiatrists award:

https://www.youtube.com/watch?v=kP5ZQsZB3hs&has_verified=1

Players responded with particular praise and heart-warming messages of support, some of which were featured in an accolades trailer shortly after release of the game:

https://www.youtube.com/watch?v=-n7RTnRZ_QQ

The game was released with a documentary detailing the deep collaboration, over its three-year development, with mental health consultants and Wellcome to ensure an honest and empathetic representation of the science and lived experience of psychotic mental illness:

https://www.youtube.com/watch?v=31PbCTS4Sq4

Ninja Theory used the game as a platform to raise £100,000 for mental health charities and created Senua's Scholarship, a fund to provide training for mental health professionals:

https://www.youtube.com/watch?v=kP1K3HTrB7s&has_verified=1

Subsequent to its release, Tameem and Paul have continued discussions on how games can help represent mental health conditions and promote mental wellbeing. These discussions have resulted in the Insight Project, the idea that games could go beyond representing mental health issues and become a tool for treatment strategies.

Like *Hellblade*, the development process will be open, supported by regular public updates, which in turn will help promote interest and collaboration with other experts and technology providers.

It is hoped that this open approach, whereby results are scientifically verified, will encourage and inspire new approaches for the treatment of mental distress.

The Insight Project: A New Treatment Strategy

Mental ill-health and distress affect everyone. Despite a pressing need for preventative measures and for safe, precise and sustained treatments, existing approaches, including drugs and psychotherapies, have proven only partially effective. There are at least three reasons for their disappointing collective limitations:

1. Traditionally, there has been an emphasis on diagnostic categories that are loose and unreliable. But it is often more useful to think about treatment in terms of the individual: the experiences and symptoms that they are having, what these mean to them and the degree to which they cause suffering.
2. The brain/mind is an adaptive organ – it resists change and develops tolerance and resistance to drug effects. It can also be remarkably resistant to the changes that psychotherapies seek to bring about.
3. Mental processes emerge from a complex interaction and integration of brain, body and environment. But treatments often seem to be aimed at just one factor. Failing to take into account the complexity of the interactions may severely limit overall efficacy.

We therefore see a pressing need to find approaches to improving and maintaining mental health that are highly personalised, that recognise and even capitalise on the adaptability of the brain, and that see mind, brain, body and environment as an integrated adaptive system in a state of delicate balance.

This presents a profound challenge, but it is a challenge that can be overcome if we are willing to take a diverse and multidisciplinary approach. Such an approach can draw on the fact that the world has moved on: we are each connected to the cloud and we have access to rich virtual experiences that can be personalised. Machine learning on large datasets is solving previously intractable problems, and biometric wearable technology is becoming commoditised.

It is no longer a pipedream to envisage self-administered, adaptive, individualised, automated approaches that draw on this technology. The opportunity is out there to help bring effective mental health treatments to the mainstream. This coming together of personalised virtual simulations, sophisticated data analysis, and biometric control, encompasses what we term the Insight Project.

Our goal is to create and inspire a movement to help mental health treatment go mainstream

Section 1 – Principles of The Insight Project

Negative Emotions are Physical, Mental & Contextual

There are competing theories over how emotions are represented in the brain, how they relate to signals from the body and even over the basic questions of whether there are truly distinct types of emotion. It is unlikely that these questions will be settled any time soon, but there are certain principles that most agree on. These principles offer us important clues about how we might think about emotions and mental distress, how we should measure them and, ultimately, how we might help people to control them. These principles are:

(i) Emotions have physical as well as mental subjective attributes.

Emotions like fear and anxiety comprise not just thoughts (feelings of impending doom or disaster, the sense of unease, readiness and anticipation) but also physical sensations from limbs, skin, chest and abdomen. Focusing on these physical signals may well prove fruitful.

(ii) No single brain region, physical sensation or subjective state will map directly onto a particular emotion.

Under some circumstances, butterflies in the stomach, accelerated breathing and a racing heart may be unpleasant and frightening, under others, it signals excitement and elation. Circumstances and context, as well as sense of control, dictate just how positive or negative an experience may be. Any attempt to measure and monitor the markers of emotion is going to require a willingness to engage with complex, context-dependent interactions among brain and body signals.

(iii) Emotions are the subjective interpretations of complex physical states.

Emotions depend on our expectations and inferences. Recognising this offers a window of opportunity to the skilled game designer whose metier is the creation of absorbing, compelling situations and narratives. By assuming exquisite control of story and context, the designer has a chance to shift the interpretation of physical experiences and, hence, to help modify emotional responses.

Understanding brain-body relationship is crucial, but games give us the third missing piece – control over the environment

Separating Symptoms from Suffering

Diagnoses like “schizophrenia” can, when applied to an individual, produce fearful and distrustful reactions in others. The ensuing ostracism and stigma can be more distressing to the individual than the experiences which led to the diagnosis: experiences such as voices and persecutory beliefs.

How much of our mental fears, anxieties and illnesses come from the way our symptoms are stigmatised and interpreted? Regardless of symptoms, if you can live a satisfying life without excessive suffering, why should you be labelled mentally ill? Symptoms and suffering can be separated.

There is a huge variability in how people view their experiences. Some embrace the medical view, that they are symptoms of a disturbance or disease: something that requires a remedy. Others, who may have very similar experiences, reject the idea of illness or disorder. Some may choose to embrace these experiences, accepting their reality and valuing their uniqueness.

It is often possible, and indeed, wise to avoid polarised arguments over what is illness and what is not. The important and pressing question concerns the degree to which the experience occasions personal suffering, either directly or indirectly, and, if it does, what may be done to mitigate this. The answer may lie not in seeking to remove or suppress the experience but rather to find ways to alter its effects.

We are not looking for cures for symptoms, but for effective strategies for dealing with fear and distress

Visualising our Mental Health

No one escapes mental suffering. We all experience grief, depression, anxiety, anger, hopelessness, confusion, paranoia and other hallmarks of mental illness at one time or other. It is utterly normal to do so. However, we tend to only pay attention to our mental health when problems are far-advanced, when medical intervention or psychotherapy becomes a requirement by which time successful treatment becomes markedly harder.

Prevention is the best cure, but this requires us to be able to monitor our mental health, which is profoundly difficult because it is complex and abstract. Weakness or pain in a muscle due to over-use is easy to detect and has clear and obvious causes. And we know the best remedy – to go easy on that muscle and remove the stress, which is the source of the problem, at an early stage. But, if we find ourselves feeling low, anxious or poorly-motivated, it is often hard to pinpoint the cause and we may well put it down to some personal failing, resolving to overcome it without really knowing what we are trying to overcome.

We may be irritated at ourselves, trying hard but becoming ever more self-critical as we fail to measure up. We find it difficult to pick up the early signs, to respond appropriately or to recognise further deterioration. And to make matters worse, though most of us are only too willing to complain to a friend or colleague about a torn muscle, and to seek and accept help, the same is not true for mental distress.

Imagine a technology that can monitor our mental state in real time and represent it so that it can be effortlessly seen or heard. Mental states are complex constellations of experiences and emotions. We need to envisage a technology that could pick up the subtle and basic components of change. These are manifold and may be extremely subtle: shifts in muscle tension, altered cardiac and respiratory patterns, changes in skin and ocular indices of anxiety and tension. If we can develop such technology, and make it easy to apply widely, it's not a huge leap to imagine this being the first step towards prevention.

An individual could identify triggers and try various strategies, seeing the results of these immediately and thereby finding the one that works for them. In essence, just as the early pain of a muscle tear allows us to take immediate steps to lessen the damage and promote recovery, so a growing subjective access to, and awareness of, the early warning signs for mental ill-health, could provide the impetus and the ability to take the right steps at the earliest stages.

We must manifest our mental state in order to take action and strive for mental wellbeing

Videogames for Mental Wellness

A key principle of meditation involves awareness of the body: the breath, the heart, the muscle tension, as well as awareness of intrusive thoughts. By becoming aware, we can step back and take action to calm and control our body and mind. As healthy and useful as meditation is, it takes a big step to commit to learning such techniques and persist for long enough for it to be useful. It is difficult to do and difficult to know if you are doing it successfully. Many people are put off by these difficulties.

Videogames are designed to engage you for days on end, to teach you new skills, and challenge you in such an absorbing way that mastering those skills becomes a goal and a pleasure. With the right design, using your physiology as an input controller, it should be possible to visualise, guide, and master a game based around your wellbeing.

Videogames engage, train new skills and promote mastery, a toolset that can be applied to mental wellbeing

:

Overcoming Stigma with Design

Stigma is a monstrous barrier towards seeking support and treatment. A person with a fracture receives sympathy and support and usually has little difficulty in accepting their own needs and the willingness of others to help them.

Conversely, something like depression makes you feel like a failure, a feeling that is kept hidden and sometimes compensated for by avoiding help for fear of becoming a burden. At the same time, personality tests that measure intelligence, emotional IQ, and so forth have no such stigma as they are framed as mental games, not as diagnostic or treatment tools. The enormous success of the *Dr Kawashima's Brain Training* videogame is testament to this.

Hellblade, a game where you are asked to play as someone who experience severe psychosis, showed that you can dress complex issues in compelling, emotive and artful ways and present it as a mainstream entertainment experience.

If we want to reach a mainstream audience, the Insight Project should be a compelling, rich and desirable mainstream experience, not a soul-less app of which there is a glut. It should appeal to our desire for entertainment, our curiosity, our need for reward and our thirst for challenge.

An exciting and immersive AAA game experience will overcome the stigma of treatment

Section 2 – A Practical Approach for Identifying Suffering

The Primacy of Fear

The project must begin somewhere, and we suggest that the experience casting the largest shadow is fear. It is present in anxiety, phobias, PTSD and psychosis amongst others. Moreover, when we think of experiences like voices or visions, it is often the accompanying fear rather than the perceptual experience that causes distress. Fear makes us lose grasp on reality, act irrationally and is at the root of much mental suffering.

The intuitive approach is that symptoms beget suffering and so curing the symptoms is key to curing the suffering. This is as intuitive as plucking a guitar string to make a sound. But what if we turn it on its head? Can making a sound vibrate the guitar string? Well yes, it can and does. Pioneering psychologist William James was one of the first to take this counter-intuitive but intriguing perspective when he said that "we feel sorry because we cry, angry because we strike, afraid because we tremble". In other words, the emotions come from the physical responses, not the other way around. Though a simplification, this is partly true.

Can controlling fear itself help ease our symptoms? This is the core idea we will explore. If true, it offers the possibility of a focused interventional approach that could cut off suffering at its source:

Fear itself is the key experience we will strive to overcome to reduce mental suffering

Exposing and Identifying Fear

At its most basic, fear is a mental state with an associated physical response. The physical and mental are intimately linked. Indeed, it has been argued that one cannot experience fear in the absence of its physical attributes.

But can we "fingerprint" fear by examining its physical, measurable attributes? If we can then we are confronted with an exciting possibility: by identifying the parameters of fear, we can measure them and, critically, characterise how they change in relation to particular situations and interventions, both externally created by the skilled game designer and internally shaped by the individual.

The responsive and absorbing narratives and contexts of the video game become the arena within which the individual learns to recognise, identify and even harness their physical and physiological responses. The game becomes the learning environment in which they can gain control of fear.

These are exciting ideas with important implications but reality dictates that we begin with more fundamental and basic questions including:

- What are the core physical and physiological features of fear and what are the best ways to measure them?
- Do these physical features reliably indicate fear? Do they vary from person to person? Do they vary from one time to another within a single person?
- Fear seems to come in many forms: can we distinguish sub-types of fear subjectively and in terms of the accompanying physical and physiological responses? Are there a plethora of mental states of fear that we do not yet have words or categories for?

Biometric signals are not new and if there were to be easy answers to the above, they would have been found by now. The reality is that biometric signals present a great deal of noisy data that can be hard to interpret or make sense of. Without a precise context for what is going on in a subject's mind, the data is next to useless. But here is why we shouldn't give up:

- Low-level biometrics like pulse, sweat and breathing monitors are becoming commoditised, opening the door to a lot of data
- EEG and neurotechnology has advanced greatly, opening new data streams
- Big data analysis and machine learning are creating superhuman pattern-spotting algorithms
- New methods of analysis such as voice, eyes and facial recognition are bringing us higher-level signals to add to the mix. Furthermore, the precise and accurate quantification of these measures in naturalistic settings is becoming ever more achievable.

So, a strategy may be to look for a "fingerprint" of fear across multiple biometric data streams in a person rather than to try and derive a meaningful fear state from any one noisy data stream. It may well be that identifying these fingerprints requires machine learning, as they may be too obscure or impractical to identify manually.

We must reveal fear in its many guises from biometric data using big data analysis

Invoking Fear through Control Contexts

We cannot bring a scientific approach to the understanding of fear without the capacity to observe states of fear. Experimentally, this means that we have to be able to induce a controlled state of fear in an individual so that we can detect and study their responses in the many forms that they take.

In this respect, the game designer has a set of powerful skills. Games can induce precise fear states and we do so through storytelling and immersion. Take the opening of *Hellblade* in the canoe: one can observe that most gamers playing the game on Twitch share the experience of 'dread' and one can imagine that they would produce similar physiological signals as a result.

With the capacity of games to create precise simulated scenarios – control contexts – we can model ideal settings within which we can do unique experiments on fear, inducing states, recording signals and manipulating immersive contexts such as VR and non-VR settings.

Against these control contexts and suitable subjects, we will measure every signal we can and look for fingerprints in the noise. We can increase the sample size to many players and see if there is a common fingerprint for fear states across different people. We can also look for an overarching signal for fear itself.

Our approach explicitly recognises that key parameters may not be the absolute values of particular signals (e.g. heart rate) but rather the dynamic shifts in these values (e.g. beat-to-beat variability of the heart, or rate of change of respiration). Indeed, core signals may lie in higher level interactions between variables, such as the degree to which heart rate variability is determined by respiration patterns.

We will use videogame scenes to give control contexts to biometric signals to help phenotype fear

Section 3 – Strategies for Representation, Control and Play

Meaningful Representations of Biometrics

It's easy to provide someone with a representation of any one of myriad markers of their current physiological state. But for them to be motivated to use this information, it should be represented in a way that is credible, salient and compelling. Many attempts at this fail because either the nature of the signal, or the means of relaying it, are felt as abstract, impersonal and non-intuitive.

If a person's attention and imagination are not captured, their engagement will be short-lived, just as it is for many apps and meditation programmes. Here, the game designer has a relevant set of powerful and finely-honed skills. In combination with a scientific approach and cutting-edge biofeedback technology, the prospects for overcoming the challenges of visualising bodily signals in a useful way are exciting.

We will begin by exploring a number of basic questions such as:

- Is a precise, absolute representation of, say, heart-beat more important than one that tracks the rate of change? (as a simple example, we might use a stimulus movement to precisely mirror the beating of a player's heart – beat for beat – or we might simply allow the overall change in speed or character of movement to change in a way that mirrors the heart rate but does not follow it absolutely).
- Which types of visual feedback from functional to abstract give a better sense of connection?
- What role does audio play as compared to visual representation?
- Does seeing a character that represents you give you a better sense of body connection?
- Will representing your fear as an enemy character help you defeat it?
- How engaging and polished do these representations have to be in order to engage?

As we explore and test these prototypes, we will explore the answers and pose more questions such that we build a set of basic design rules and principles for biofeedback representation.

From there, the path opens for more sophisticated gameplay design and worlds such that our body and mind affect the world and characters that inhabit it. This is not unlike meditation techniques that start with breathing control and awareness, and then move to more abstract visualisations of water streams and beaches. We can achieve much richer experiences in a more precise, reliable and engaging manner.

Representing and connecting with our biometrics is key to awareness and agency over them

Personalising Representations

Our previous work on *Hellblade* won plaudits for its ability to represent complex mental states and experiences. We aimed to portray psychosis for the purpose of understanding and communicating it. People have used our carefully-crafted representations to reveal to others what psychosis and mental distress are like for them. But this is just one facet of what we can do with the remarkable potential offered by games to communicate and understand mind states.

What if a person is given control of a simulation and is able to fine tune it so that it most accurately captures their inner world? This could be done using a personalised control context by tuning simple sliders, a common mechanic in popular games used for customising levels or characters.

This in turn could form the basis for individually-tailored game experiences that adapt to the player and their progress in overcoming or reducing their symptoms.

Personalising mental states could lead to new ways to communicate distressing mental experiences and a powerful means of providing precise data. This could be of use to mental health professionals in developing new ideas about the nature of mental symptoms and how they should be classified.

User-created simulations could offer a basis for phenotyping and treating mental states

Taking Control and Effecting Change with Gameplay

Optimising the recording and representation of bodily signals is the first step towards the goal of finding out how an individual can learn to change these signals. We envisage at least three ways in which change can be effected:

(i) Acquiring control over bodily states such as respiration and heartbeat.

(ii) Re-labelling or reappraising those signals cognitively such that a given set of experiences can be seen as less intrusive and more controllable.

(iii) Predicting and preventing; by understanding the nature and origins of symptoms and by identifying the early signs of change, an individual may be able to develop and use a sophisticated early-warning system and use learned strategies to re-establish control and prevent more extreme and unpleasant experiences.

These possibilities and questions will be explored through a series of prototypes where we introduce game design principles such as reward, challenge, competition, score, gameplay loops, metagame progression and so on. Vital skills can thus be developed and strengthened in engaging and enjoyable ways.

We will use standard game design principles to explore mastery over biometrics

Reframing the Psyche with Virtual Therapeutic Techniques

While biometrics deal with one part of the psyche, we should not ignore the importance of psychiatry and therapy in helping people reframe their anxieties and fears. Techniques such as CBT and exposure therapy are proven to work and other techniques such as avatar therapy show great promise.

A virtual simulation can replicate these techniques and dress them in an engaging, emotive and compelling way. People who play *Hellblade* care for and believe in Senua and there is no reason to believe that we cannot repeat such personal engagement with virtual avatars and stories to help guide players out of their fears. The expertise of a dedicated therapist will be sought for consultation on how best to create effective simulations that capture the fundamental principles of their approach.

One advantage we have is that our other commercial games projects currently in development at Ninja Theory will feature extremely sophisticated virtual characters that will be able to respond, interact and engage players in worlds that appear grounded and real. These assets can be leveraged to provide a level of simulation and immersion for the Insight Project that is well beyond the capabilities of standard research efforts.

We will seek higher-level emotive engagement with virtual avatars, worlds and narratives to replicate the best of current therapeutic techniques

Section 4 – A Practical Solution for Everyday Life

Inferring Complex Data from Consumer Biometric Devices

Using scientific measurements as the basis for widely applicable purposes confronts us with a paradox. The essence of measurement is precision and reliability which can entail expensive, bulky and temperamental equipment set-ups. But, while we wish to optimise precision and must therefore use high-end equipment and rich complex datasets, we also require easy applicability in a wide range of settings. To begin with, the science will take precedence, but we must then turn our attention to fashioning practical devices, affordable and usable by the ordinary person.

In this respect, everyday devices such as Fitbits and phones are able to track biometric data and we may be able to capitalise on these. Alternatively, it might be possible to create and manufacture a custom device that fits our needs. However, the data is not going to be anywhere close to the precision of specialist medical devices nor will it track the range of data we can measure in our lab.

How do we bridge the gap? We anticipate that a machine learning system could be trained using the high-quality lab hardware and a large enough sample size. Its ensuing application to more sparse datasets would be optimised by the prior principles and knowledge gained from a growing database.

To achieve this a significant R&D effort would be required and access to machine learning technology and expertise.

Employ machine learning to estimate high-quality data from sparse biometric data found in mainstream consumer devices

Optimising for Success with Data Analytics

In traditional experimental work in neuroscience, small, sparse datasets – often collected in laborious ways – place a limit on progress. But it is common practise in games, especially in online games-as-a-service, to track many datapoints for each player and across all players and thereby to acquire extraordinarily rich longitudinal measures of engagement and performance. This data is typically used to track progress and engagement and to optimise monetisation. We see an alternative potential for this precise and intensive, but simultaneously easy and unobtrusive, monitoring.

From this data, global changes to the game are made over a period of months and years to improve players' experiences and, crucially, the data is fed back to each individual player to offer a tailored experience that encourages engagement and a measured sense of progress and success.

It is likely that big data analysis and machine learning techniques will have to be developed as the data set grows. The more data that is available, the more precise we can be about optimising for success. Of course, this presents challenges with respect to individual privacy and we will commit to ensuring that GDPR considerations are at the forefront of any such developments.

Data analytics using a large sample size of players can help optimise each of us gain expertise in biometric control

Transferring Skills from the Virtual to the Real World

If we reach this point, we will have created a rich and rewarding experience to help people to manage, control and reframe their fear in a controlled and curated simulation. But how to carry over this skill into everyday life?

In many ways, this challenge is akin to those faced by the traditional therapist whose goal is to help a person take insights from the controlled therapeutic setting and apply them more generally. We can therefore learn from how these challenges have been met in the past. For example, a therapist may give a patient a stimulus or memento that can provide a focus during times of stress or panic and thereby prompts the use of learned techniques. In combination with increasing feasibility of continuous monitoring of key individual variables (such as heartbeat), this approach could prove highly effective.

Another observation is that players who become experts at a game, require fewer and fewer feedback elements to be able to successfully continue playing that game, as is demonstrated in this video of a Tetris player playing with invisible shapes: https://www.youtube.com/watch?v=6YOR-nAnj4I&feature=youtu.be&t=300

As players progress through the Insight Project, we can design the game to rely on fewer and fewer feedback elements. It may be that over time, you can reduce the biometric feedback elements to zero, simply by virtue of the player having become aware of their self through sustained play.

More likely, perhaps a wearable device such as a ring, watch or band can offer vibrational or audio cues to help players in everyday life cope with a situation and guide them back to calm.

We will find ways for learnt techniques to carry over into everyday life with minimal intrusion

Clinical Application & Knowledge Sharing

Since the release of *Hellblade*, the game has received some interest from clinicians and researchers where it has been employed as an educational tool and as the basis for limited scientific study.

For the Insight Project, we can design the experience to offer a far more sophisticated set of tools that would allow researchers to modify, test and publish scientific studies. There is precedence for this in game development circles in the form of "modding".

Modding is a common gaming term whereby a game is released with an allowance for sophisticated user-customisation. This is typically used to create variations of the experience or, in some cases, entirely new game experiences. Combined with our commitment to GDPR and the Open Science framework, we can offer the scientific and clinical community a tool set and data for further research, and to clinicians, a platform for exploring new therapeutic strategies.

There are several advantages to this open approach: it will encourage more research and knowledge sharing that could feed back into the Insight Project resulting in a more effective product or service; it will help encourage scientific validation of the Insight Project from independent sources; and last but not least, it will help spread new ideas and approaches to mental health treatment.

We will aim to provide a platform for further research and clinical application to help inspire the Insight Project as a legitimate approach to mental health

Final Thoughts

Advances in neuroscience-based understanding of mental distress and ill-health point strongly to the need for more precise understanding of how body, brain and environment interact. Moreover, if we are to develop sustainable, useful and widely applicable approaches to mitigating mental distress, it is increasingly clear that focusing on any single one of these factors – brain, body, environment – will be inadequate.

We suggest that the exciting developments in technology that are beginning to enable precise and convenient measures of individuals' physical and physiological states can be combined with our knowledge of how the brain processes these physical and physiological signals in order to generate new insights into how negative emotions and mental distress can be represented and controlled.

Crucially, the exquisite skills of games designers in creating compelling worlds and narratives offer optimal contexts within which individuals can experience and learn about these body-brain interactions, developing the skills to recognise and control them and, as a consequence, to profoundly change their experiences for the better. Individually-sensitive and responsive game mechanics will offer unique and enjoyable personalised training that can be generalised to the everyday world with a consequent improvement in mental well-being.

Over the last decade the games industry has advanced real-time technology such as virtual avatars, human-computer interfaces, machine learning, data analytics, online technology and engagement strategies to a level that is grossly underestimated by those unfamiliar with the innovation present in modern videogames. Applying these methods and technologies to solve a real-world problem is especially exciting given the successful precedent of collaboration between game-makers, scientists and mental health consultants on *Hellblade*.

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. It will be innovative and creative but will adhere to scientific principles of ethics, governance and open dissemination of data and results.