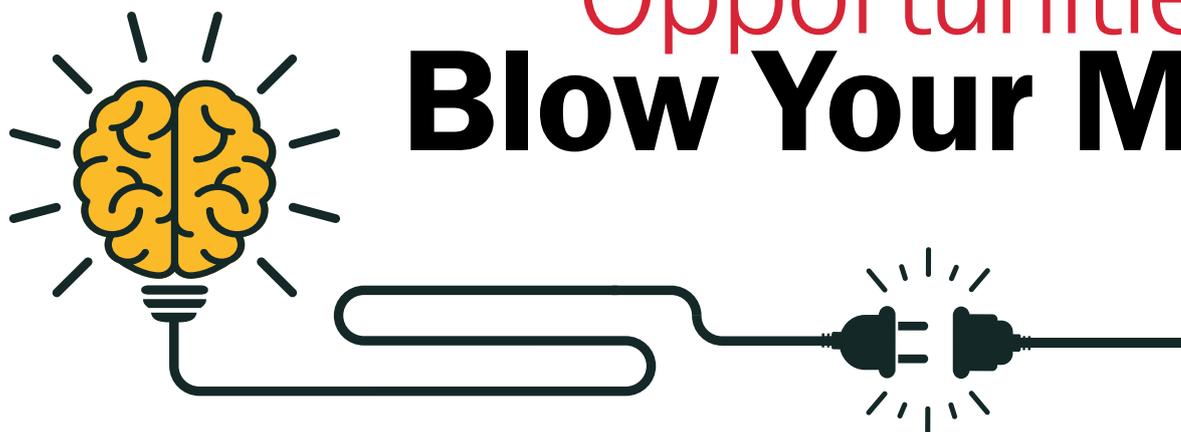


Telepathy might be the stuff of occultist fantasy and science fiction but digital disruptors in mental health are harnessing increasingly sophisticated technology to monitor our minds as well as our bodies. Candesic partner **Dr Michelle Tempest** explores the brave new world of cyberpsychology and the new breed of start-ups ripe for investment



# Opportunities to Blow Your Mind



**W**hat a year 2020 turned out to be! Covid, lockdowns and vaccines are the talk inside every household all around the globe. Covid unites every country, colour, class and creed to push forward the boundaries of life sciences and rocket boost vaccine development.

For many though, this year has been tough. Physical distancing, social isolation and job insecurity is starting to take its toll.

Figure One illustrates the initial waves of intensive care requirements and physical health symptoms that could spell a tsunami of mental health hyper-demand.

On this note, I urge all readers to think how they can help those who are suffering. In the words of John F. Kennedy's inaugural address, 'Ask not what your country can do for you – ask what you can do for your country'. Civic action on mental health is the call to arms for providers, investors and keyworkers to think of new solutions.

Figure Two illustrates that investment is entering new technology for mental health, with 2020 predicted to increase both volume and value of deals.

Personally, I am delighted the world is set to focus more on mental health, yet surprised that 'healthy thinking' as a concept is often overlooked by society, while healthy eating so easily trips off the tongue and shapes lifestyles. People carefully choose what food to ingest, yet few consider how brains are passively

exposed to adverts and subjected to the pings, rings and dings of digital updates. Healthy thinking requires the brain to be put centre stage and nourished, just as the body deserves more than junk food.

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SCI-FI BUT  
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The biological boundaries of the brain are increasingly blurred by digital technology.

In the wild, you'll frequently see stunning combinations of symbiotic relationships. The African Oxpecker bird feasts on insects hidden within the stripy fur of zebras, and prevents tick bites in

a harmonious fashion. The clematis and crab apple plants thrive together and during spring produce a double whammy of blossom beauty.

However, there are also examples of toxic partnerships. Climbing vine shoots can rapidly outgrow their host and many garden hedgerows have succumbed to such strangulation. The list of proliferating platforms and apps is almost endless.

In 2012, a survey of over 2,000 US secondary school teachers showed 87% believed 'digital technologies are creating an easily distracted generation with short attention spans'.

## One-track mind

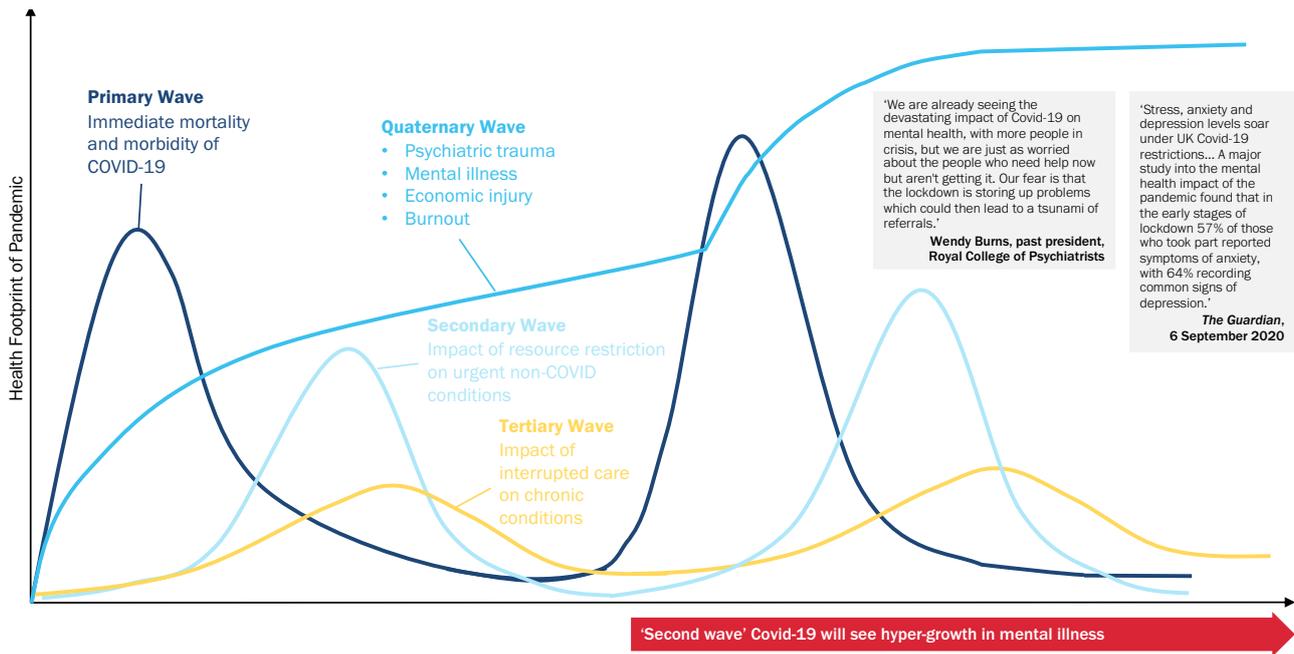
One interesting dilemma to spin out of this new world of digital enablement is to what extent our body and mind can be tracked?

Some start-ups are aiming to read the human mind and even want to crack telepathic communication.

It may sound like the stuff of sci-fi but if anyone thinks they can ignore or hide from technological advancements in telepathic communication - think again! Mind monitoring is pressing forwards with such veracity, that the old joke, 'welcome to telepathics anonymous, don't bother introducing yourself', may not be said in jest much longer.

Collecting feedback is not new, but the new kid on the block is 'cyberpsychol-

**FIGURE ONE**  
**COVID-19 IS PREDICTED TO HAVE A LONG-TERM IMPACT ON PSYCHO-SOCIAL ISSUES DRIVING DEMAND FOR MENTAL HEALTH SERVICES**



**NOTE** SURVEY OF 1,099 UK ADULTS EXPLORING CONCERNS ABOUT THE IMPACT OF THE COVID-19 PANDEMIC ON THEIR MENTAL WELLBEING, MARCH 2020  
**SOURCE** CONCEPTUAL MODEL FROM DR. VICTOR TSENG (ATLANTA, USA); CANDESCIC ANALYSIS

ogy', where feedback can be captured passively.

This newly coined term is about technology recording data direct from the body and brain. To date, cyberpsychology has only been used around the fringes of the video gaming world.

Some games require players to attach

themselves to a heart rate monitor. The video game then uses this information to deliberately keep gamers between defined psychological parameters of arousal. The game gets spiced up when their heart rate drops to ensure the player is kept above the boredom threshold, and toned down when their heart races

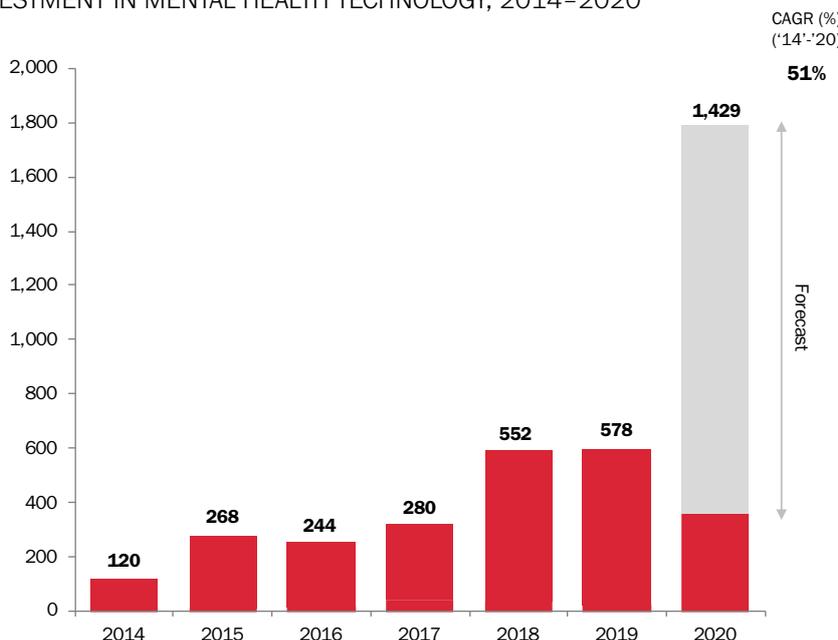
to maintain arousal below panic level.

The aim is to mesmerise the full spectrum of video gamers, with a calmer experience for first time scaredy-cats through to the full-blown epic experience for adrenaline junkies.

Cyberpsychology monitoring is becoming both more mainstream and commer-

**FIGURE TWO**  
**INVESTMENT IN MENTAL HEALTH TECHNOLOGY HAS SKYROCKETED IN 2020**

INVESTMENT IN MENTAL HEALTH TECHNOLOGY, 2014-2020<sup>1</sup>



**Investment in mental health is set to grow both volume and value of deals**

The number of deals has more than tripled

The increase in funding is being driven by big deals - the average deal size in 2019 was £5.4m, compared to £11.6m in Q1 2020

*'In just the last few weeks, we have experienced over 15x increase in usage of our platform, including measuring outcomes remotely and using wellness tools and our various coping mechanisms.'*

**CEO, Digital Health Platform**

**NOTE 1** 2020 FORECAST BASED ON FIRST QUARTER DATA  
**SOURCE** CANDESCIC RESEARCH AND ANALYSIS

**FIGURE THREE**  
CYBERPSYCHOLOGY - CREEPY OR CARING?



SOURCE CANDESIC RESEARCH AND ANALYSIS

cialised. Collecting biometric feedback was previously restricted to the realms of research labs, but interest is sprouting up to delve deeper into the brain's internal world of activity.

Take the example of recording the brain's waveforms. This can be done by sticking electrodes all over the head, via Electroencephalography (EEG).

Figure Three illustrates some other measures in the bag of tricks of cyberpsychology:

- **Electrooculography (EOG)** monitors eye movements and pupil

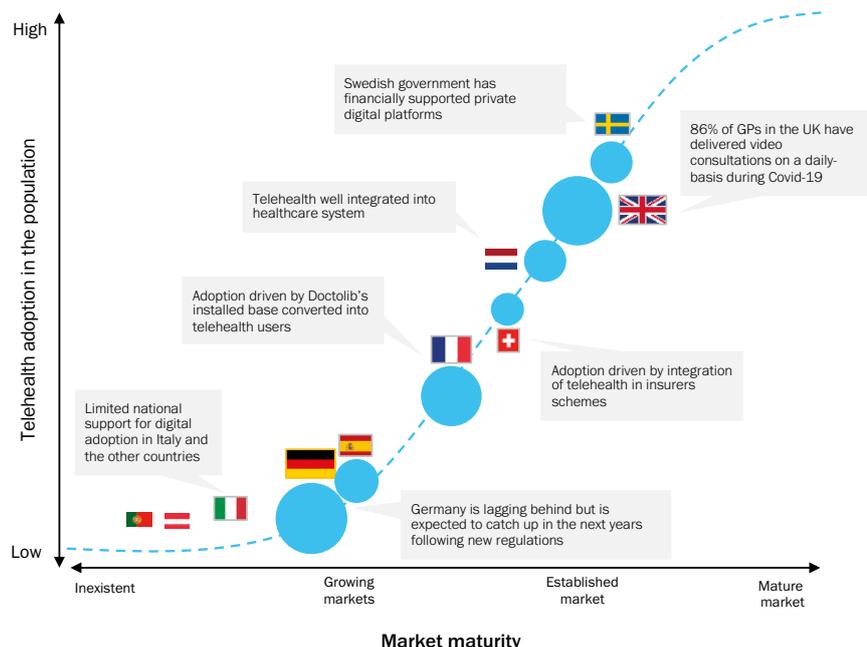
size. How much the pupil dilates can be a tell-tale unconscious sign of attraction. Some dating websites are on the cusp of adding EOG technology to their online platforms

- **Galvanic Skin Response (GSR)** to measure arousal, stress and engagement by measuring skin conductance
- **Electromyography (EMG)** to measure muscle tension and stress, tracking spatio-tempo-

ral characteristics of electrical impulses associated with muscle contractions

- **Gastronintestinal Motility Monitor (GIMM)** used to monitor gut motility. For many this may be sharing too much information! It's also a bit more involved as it requires swallowing a special ingestible device, encased in a capsule, which opens up inside the digestive tract and uncurls, in a similar way to opening up origami paper, to reveal the monitoring sensors

**FIGURE FOUR**  
THE ADOPTION OF TELEHEALTH SOLUTIONS ARE ACCELERATING RAPIDLY, THROUGHOUT EUROPE



**Covid-19 has put on a spotlight on telehealth and digital adoption in mental health**

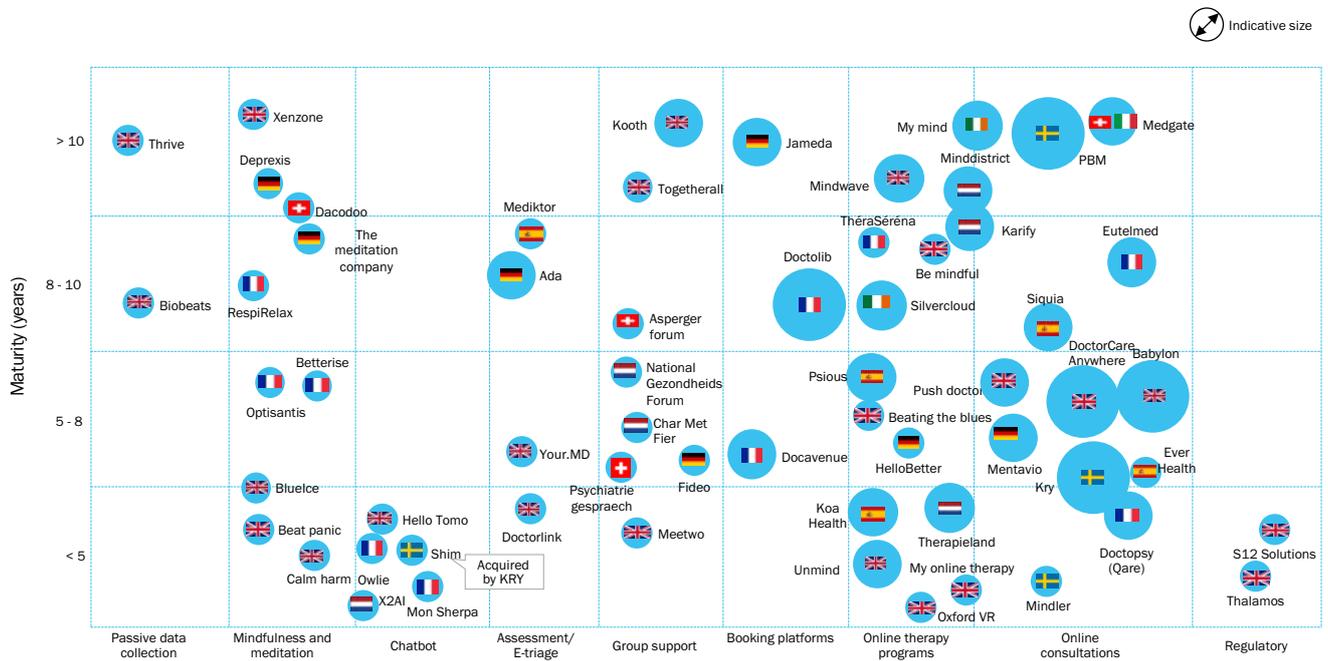
Telehealth usage – on the part of both patients and providers – **has meaningfully accelerated due to Covid-19 and payers' responsive initiatives**

Going forward, **telehealth use will likely come down but remain above pre-pandemic levels** as providers expand their offerings and as patients embrace the technology

Companies can **ensure they are future-facing by offering telehealth solutions** for their customers

**FIGURE FIVE**  
**THE EUROPEAN DIGITAL MENTAL HEALTH MARKET IS HIGHLY FRAGMENTED ALONG THE CARE PATHWAY**

SEGMENTATION OF THE SUPPLY DIGITAL MENTAL HEALTH LANDSCAPE IN EUROPE



SOURCE CANDESIC RESEARCH AND ANALYSIS

**Combining data and AI**

To date, many of these advancements are developing in separate silos. But over time these big bulky data sets can be combined and analysed with the help of AI, and insights will be inevitable.

Although cyberpsychology and brain hacking remain a long way off, there are interesting developments.

A well-publicised start-up based in California that is trying to predict population based human psychology and emotions is called Mindstrong Health. It uses an app installed on mobile phones to monitor cognition, mental and emotional health.

The app measures how users interact with their phones, such as the way they type, tap, and scroll. This data is then securely fed back to the Mindstrong databank and analysed using machine learning, where continuous monitoring benchmarks the data twice. First, to compare individuals against each other, and second to understand personal variation.

The mundane minutiae of phone interaction is a goldmine of cyberpsychology data; it tracks speed of typing, error rates, how frequently characters are deleted, and how fast contact lists

are used and scrolled. The analysis also gives insight into how fast the phone user switches from one task to another.

Mindstrong believes it can predict and prevent depression.

In research, it recruited 150 people to undergo standardised and validated neurocognitive assessments, including tests for episodic memory and executive functioning, and compared this against phone feedback data.

Paul Dagum, founder and CEO of Mindstrong, says it monitors 24/7 and believes that smartphone usage correlates with lengthy cognitive performance tests. 'It's like having a continuous glucose monitor' in the world of diabetes, but for mental wellness, he said.

Figure Four highlights that all European countries are on the trajectory to digital maturity in telehealth.

The UK and Sweden have been leading the pack, but Germany is one to watch after passing the Digital Care Act – securing remuneration for online consultations.

And finally, Figure Five illustrates a spectrum of digital players aiming to be part of the solution for mental health across the care pathway.

What's evident are the opportunities for consolidation and how operators are already viewing this pipeline of start-ups as fertile M&A opportunities.

**So what next?**

In summary, the revolution is happening right here, right now as our collective acceptance of technological innovation delves deep into the mind and implants direct into the brain.

It's imperative for everyone to be emotionally engaged on the journey of digital advancement.

For anyone interested in digital health and mental health – please do make contact; there are pearls to be found inside oysters.

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