

## Summary:

On a societal level the digital revolution has meant we are conditioned to treat instant gratification and control over how others perceive us as the norm. Here, the potential consequences of this on the mental health of the population are illustrated, including:

- A psychological dependency on computer, social media and phones being linked to issues with brain development, dopaminergic pathways and grey matter volume
- Decreased synaptic connectivity in the developing brain
- Disrupted sleep patterns in adolescents

However, digital technology offers new tools and opportunities to overcome the unprecedented pressure, waiting times and workforce shortages within the profession. Examples of tools that could be harnessed which are explored in further detail include:

- New modes of assessment
- Digital apps with opportunity for psychoeducation and therapies
- The use of virtual reality to control social environments and understand risk factors, particularly in patients with schizophrenia

Following an analysis of the potential tools that could be used, I have described the concerns that both psychiatric staff members and patients have voiced about the technology. For example, there are risks that a digital divide may be created as some patients may be more technologically literate than others, not to mention risks of poor uptake and user retention of the interventions themselves.

To conclude this analysis, I conclude that a combination of tools (for example through hybrid clinics) may be most appropriate going forward, and that it is vital to consider that going 'digital' will not necessarily solve some of the problems that psychiatry currently faces.

# The Future of Psychiatry in a Digital World

## Introduction:

UK household internet access currently stands at 90% (1), with the adoption of smartphones amongst adults in the UK rising from 52% to 85% over the past five years (2). As a result, modern society has now been conditioned to expect information on demand and receive instant gratification, offering us a new sense of control over how others see us rather than portraying our vulnerabilities (3).

The digital revolution is set to transform the delivery of health care, however as aspects such as big data, computing power and networked information is emphasised, mental health care is simultaneously under unprecedented levels of pressure (4). The 2021 Royal College of Psychiatrists census revealed that 1.5 million people in England are waiting for mental health treatment (5). The majority of individuals who are in need of psychiatric treatment do not receive it (6), with a lot of this attributed to workforce shortages that are unable to cope with the increased demand. Digital technologies offer innovative new solutions that look to increase accessibility and drive down costs that could be integrated into future psychiatric practice. Potential solutions include but are in no means limited to virtual reality, apps with self-management and psychoeducation tools, online cognitive behaviour therapy and chatbots which are powered by artificial intelligence.

## Challenges the digital revolution poses for patients of the psychiatry profession:

Recently, UK universities reported that the increase in students who have disclosed mental health issues since 2007 has risen fivefold (7). Potential causes of this are multifactorial; these were the children who grew up in the ages of social media, the great recession of 2008, increased acceptability of divorce and increased incidence of terrorism (8). One explanation of this includes the exponential increase in the use of social media's such as Instagram, Snapchat and Facebook, leading to less interaction face-to-face and also the craving to be 'liked' in order to receive a sense of social validation (9).

In recent times, a growing number of psychologists and social scientists have argued that many individuals have a psychological dependency on the technology that arises with our digital revolution; which includes computer, social media and phone use (10). Novel behaviours have arisen which pose a challenge to psychiatry, including gambling, internet gaming and sexual behaviours (11). Common features can include mood changes, development of tolerance and functional impairment, with You et al (12) reporting that individuals experiencing internet addiction reported significantly greater symptoms of inattention, impulsivity and feelings of hyperactivity than non-internet addicted students (13). This can have a detrimental effect on growing and developing brains, as it can compromise the gray and white matter within the orbitofrontal cortex (14). The consequences of this on our adolescent and adult population can include poorer cognitive functioning and academic attainment, alongside a decline in interpersonal relationships and poor food habits (10). There has been a strong correlation established between internet addiction and mental health, with Okwaraji et al., finding in Nigeria that 592% of

undergraduates were addicted to the internet, and of these 24.5% had some form of depression (10). This could be attributed to the abnormalities in the dopaminergic neural system associated with internet addiction as a result of a reduction in the number of spatial D2 receptors (15). Structural changes in the brain regions associated with depression have been implicated with internet addiction, with Lin et al. finding that internet-addicted patients had a deficit in white matter integrity, potentially resulting in reduced myelination across their brain regions (10). Furthermore, there is an association between internet addiction and grey matter atrophy within certain brain regions including the right orbitofrontal cortex, bilateral insula and right supplementary motor area (10). Cortical thickness decreases alongside a reduced amygdala volume have also been found (10).

Increases in screen time are also correlated with adverse impacts on cognitive and brain development. A recent review found that children aged two years or younger spend over one hour each day behind a screen, which increased to over three hours at age three (16). The decrease in reading time has been associated with poorer language development as well as predicted behavioural problems (13). Research looking at brain plasticity found that in a study looking at young people aged 8 to 12 years of age that more screen time and less reading was associated with decreased connectivity; in particular in the regions of the brain that coordinate word recognition and other aspects of cognitive control (13).

Screen exposure has also been found to disrupt sleep, with more use of smartphones being associated with greater sleep disturbances in adolescents (17) and poorer sleep duration and reduced efficiency in adults (18). Experiencing a poor sleep quality consistently is associated with brain health outcomes; leading to reduced functional connectivity, a

reduction in grey matter volume and an increased risk for Alzheimer's disease (19).

Explanations for this include the slow wave, blue light emitted from light-emitting diode screens which can suppress melatonin and inhibit cognitive performance (13).

The epoch of digital communication has counterintuitively led to us, as a society, being lonelier than ever. Each of these consequences of digital media on the mental wellbeing of our population creates substantial challenge for psychiatry, and may be an explanation for why there was an estimated increase of rates of a suspected mental disorder in those aged 7-16 from 1 in 8 to more than 1 in 6 (20) between 2017 and 2022, with these figures only forecasted to further worsen.

### Applications of technology to psychiatric treatment:

Paradoxically, in order to respond to the increased demand for mental health services linked to the rise in the use of the internet and media, the power of digital technologies can be harnessed in an attempt to alleviate the pressure psychiatric services are experiencing.

Digital systems offer new opportunities to foster improvements in efficiency and access of treatment options, while simultaneously driving down costs (4). This can occur from the very beginning of the treatment pathway, starting with digital assessments. Questionnaires for assessment are now available in the digital form of a website or app (21). However, digital technologies also offer new avenues for modes of assessment. Procedures using virtual reality can assess a patient's response to particular environments, such as a patient with autism's sensitivity to particular noises and sensory stimulation (22). Furthermore, sensors in smartphones and watches make it possible to track markers of a patient's mood

and wellbeing continuously – such as sleep, physical activity, speech and stress levels (21). With this information, opportunities to identify and intervene earlier may be possible, which is something particularly relevant if a patient is at high risk of suicide for example (23). This was relevant particularly within the COVID-19 pandemic, such as Summers et al.'s study (24), which indicated that the anxiety and depression symptoms present as a result of COVID-19 were significantly decreased as a result of the implementation of the use of a behaviour change application (25).

One example of a use of digital tools includes self-assessment through the use of apps that prompt patients to complete assessments at several points over the period of a day, providing new opportunities for healthcare professionals to observe fluctuations in symptoms and identify patients who may deteriorate (4). Digital apps also provide opportunities to deliver psychoeducation and therapies. In terms of psychoeducation, some tools are able to provide patients with accessible, logically structured and interactive information that can serve to normalise and help people cope with challenging experiences (4). Recent research has focused on implementing cognitive-behavioural approaches into apps and websites, to encourage patients to self-manage their experiences while receiving advice about their difficulties instead of receiving face-to-face treatments (4). An example of this includes the online programme for bipolar disorder MoodSwings-Plus, which looks to combine cognitive behaviour therapy with psychoeducation, alongside providing networking opportunities to give patients social connection with other individuals experiencing similar things, motivational interview techniques, monitoring and further cognitive strategies (26).

There is particular potential for applying digital technologies to the treatment of schizophrenia, with examples including online diaries where patients can record their symptoms, alongside a text messaging system that means patients are reminded and encouraged to engage with their treatments (27). Schizophrenia is a mental illness which has particular implications on a patient's interpretations of the social world (28). In terms of positive symptoms, social context can have implications for the frequency and strength of hallucinations that a patient experiences. Furthermore, patients often experience paranoid fears concerning how others will interpret their behaviour (29), and how their delusions and hallucinations manifest themselves is closely connected with social context (28). As a result of this close interaction, treatments that involve social rehabilitation and ability to cope with symptoms through manipulation of social context can be targeted with the use of VR. Negative symptoms including anhedonia and withdrawal from social situations often result in patients isolating themselves from social situations, making improvements in a patient's social relationships and interactions a challenge for psychiatrists therapeutically (28). The role that the social environment plays in the development of schizophrenia could be one of the explanations for the higher rates of psychosis in immigrants and in urban areas (28). Virtual reality (VR) allows for the control of social environments; a phenomena which could not otherwise be achieved (28). These virtual social environments have the potential to be used in symptom assessment, understanding the risk factors for schizophrenia, alongside determining toxic elements in an environment for a specific patient (28). VR can be applied as a treatment for patients beyond just those with schizophrenia, as demonstrated by Emmelkamp et al (30). In this study, 33 acrophobic patients were randomised to three sessions of exposure to heights either in VR or in vivo (28). It was found that both forms of exposure yielded equal levels of success in the

treatment of the patients' fear of heights (28). VR as a therapeutic tool also extends to the treatment of other anxiety conditions such as posttraumatic stress disorder and a phobia of flying (28).

VR can be further used when looking to develop personalised treatment plans for patients, as environmental predictors specific to a patient can be identified. In this case, VR could be used to determine the factors within an environment, such as noise, facial expressions or eye contact that increases the likelihood of delusions, hallucinations or social withdrawal (28). Treatment options include, firstly, educating patients about how their emotional state has the capacity to change their hallucinations by exposing them to VR after a mood manipulative element of cognitive-behaviour interventions (28). Furthermore, patients with psychosis could be exposed to their persecutory fears, allowing them to realise that they are not reality and allow them to put into practice coping mechanisms for symptoms as they are specifically occurring (28).

Digital treatments which are truly novel are low in number, however some include virtual reality based exposure to stimuli in order to treat anxiety disorders (31) and the use of robotic technologies to improve an individuals skills in social interaction in autistic spectrum disorders and dementia (32). The recent epoch of artificial intelligence offers opportunities for the use of chatbots for typed therapy so the users can talk about their mental status, alongside the use of speech analysis to track mood (33). Machine learning, used in conjunction with health data, can be used to predict client outcomes or for triaging (33). Clear advantages of the use of these therapies includes their 24/7 availability which allows patients to access support even when not undertaking a face-to-face appointment or



outside of typical working hours (33). Furthermore, digital technologies such as these give the opportunity for a 'stepped care' model to be devised, in which patients can begin with accessing help from digital services due to the anonymity and ability to avoid any perceived stigma, and then develop the confidence to engage with traditional psychiatric treatments such as CBT.

### Key considerations to be made about the use of technology within psychiatry:

There are a wide range of user, staff and organisational barriers to the uptake and implementation of digital interventions within psychiatry; some of which including user motivation, internet access and computer literacy, staff training and potential loss of the therapeutic relationship (4). A particular concern highlighted by psychiatric staff members includes a potential increase in avoidance behaviours and disengagement with services, which may have the potential to jeopardise the care that is delivered by mental health services (4). Certain psychiatric treatments may be more suited to online assessment, treatment and follow-up, with one such example being eating disorders such as anorexia nervosa. On one hand, patients may hide or overtly lie about their eating patterns, progress or weight, or alternatively may just avoid treatment altogether due to the associated shame and/or the need for secrecy (34).

There is an element of speculation that the drive for digital solutions is as a result of the ulterior motives of governments to provide a cheaper option to public service provisions or primary prevention campaigns (1). Despite digital solutions bringing new possibilities of

connecting people beyond the restraints of time or place, it is vital that the provision of public services is at the forefront of new policy when looking to improve the psychiatric service delivery (4). There is a risk that moving to virtual consultations will create a digital divide between those who can engage meaningfully with the technology and those who do not have the same levels of technical literacy (35). Furthermore, the provision of virtual consultations is not a preventative measure, which is psychiatry's current main hope when looking for ways to reduce demand and inequalities (36).

The use of technologies such as watches and trackers to determine a patient's mood and wellbeing has its disadvantages, as it may exacerbate a patient's tendency to hyperfocus on their symptoms, which has been reported to trigger further emotional instability (37). This may be one of the factors that contributes to the challenge of user retention within the user of digital mental health interventions (33). For example, it was found that when young people were given the opportunity to complete a digital mental health intervention, full completion can be as low as 29.4% (38). The reasons for this are multifactorial, however speculated reasons include app fatigue or the app not having sufficient utility or ability to engage (39). Using VR in the treatment of psychosis does not come without its challenges; as a wide variety of scenarios will need to be created for each individual patient. There is a wide variety of symptoms that patients with psychosis experience with differing environmental factors that may trigger a psychotic episode (28). Most importantly, the potential side effects that could come with VR need to be monitored closely to ensure it is successfully implemented - including checking for dizziness, migraines and eyestrain (40).

A final key thing to consider when looking at delivering therapies and treatments via online consultations and sessions are the potential consequences on the therapeutic alliance, as the ability for both the health professional and patient to recognise social and contextual cues may be hindered. The lack of non-verbal cues online may mean that emotion regulation and empathy is disrupted. For example, a chatbot could theoretically provide talking therapy, but this would only provide a form of 'pseudo-empathy' and hence result in the patient not feeling truly listened to or understood in a humanised way (33).

### The future: how can the technology be used for good

Going forward, the most scalable way of providing digital treatments is through a form of autonomous treatment, in which patients are deemed to not require support. However, it is important to consider that the provision of support will increase the likelihood of more successful outcomes for patients (21). Therefore, support needs to be provided, which could be done via face-to-face sessions or via regular telephone calls, with a key example of this being successful the use of supported self help to provide treatment for patients with eating disorders (41). Hybrid clinics are a key example of a way digital technology could be integrated into psychiatry through the combination of digital tools alongside a traditional in person consultation (42).

It is unclear so far how to best maximise the therapeutic potential of digital technologies, with many scholars advocating for an approach which blends face to face and tele-platforms (25). It is equally important to consider that the evidence for the use of digital technologies for more vulnerable groups such as the elderly, ethnic minorities and those of lower socioeconomic status is largely limited (25). In particular the elderly typically have

low digital literacy and may lack confidence when using digital solutions, which needs to be taken into account by technical developers when ensuring that mental health care is accessible to all in the long term (25).

A key part to ensuring that this occurs lies in ensuring that clinicians and patients respectively receive the necessary training and education to ensure that they are confident in using the technologies; ensuring that shared decision making can occur (42). In order to ensure the interventions are assuring good outcomes for patients, appropriate studies must be designed to test the technologies success (42).

### Conclusion:

Workforce data from the NHS have shown that there are only 4500 full-time consultant psychiatrists responsible for providing mental health care for 56.5 million people, which equates to one consultant per 12,567 (5). Future demand for health services will only increase, something inevitable when considering the potential consequences of the digitalisation of society on key markers of wellbeing such as brain health, cognitive development and self-esteem of both children and adults. In order to meet this unprecedented demand, viable solutions such as the VR and psychoeducation that could be provided remotely are needed now more than ever. However, an attitude that proposes that going 'digital' will solve all of our problems is not necessarily accurate as the potential disadvantageous consequences, such inequalities being exacerbated and a digital divide created, are acute (33).

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