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Digital technology: coming of age?

Lisa Marzano, Chris Hollis, Andrea Cipriani, Gin S. Malhi

Affiliations:

Lisa Marzano, Department of Psychology, Faculty of Science and Technology, Middlesex University, The Burroughs, Hendon, London, UK.

Chris Hollis, NIHR MindTech Healthcare Technology Co-operative, Institute of Mental Health, University of Nottingham and Nottinghamshire Healthcare NHS Foundation Trust, Nottingham, UK.

Andrea Cipriani, Department of Psychiatry, University of Oxford, Warneford Hospital, Oxford, UK and Oxford Health NHS Foundation Trust, Warneford Hospital, Oxford, UK.

Gin S. Malhi, Chair, Sydney Medical School, University of Sydney, Australia and Head, Department of Psychiatry, Northern-Clinical School, Royal North Shore Hospital, St Leonards, Sydney, Australia.

Correspondence to

Dr Lisa Marzano, Department of Psychology, Faculty of Science and Technology, Middlesex University, Town Hall, The Burroughs, Hendon, London NW4 4BT, UK. Tel: 0208 411 6998. Email: l.marzano@mdx.ac.uk

Technological advances have defined our age. Computers, the Internet, and mobile devices are ubiquitous and virtually essential day-to-day tools. Some would argue they have expanded our minds – and in doing so creating the so-called 'extended mind'. Irrespective of whether this is the case, they have at the very least permeated every aspect of our lives – to the point that most of us now rely heavily on technology and would be truly lost without our mobile phone, laptop or electronic calendar; and this is particularly true of younger generations. However, though we often refer to these as recent developments, even these technological advances are not that new. Surprisingly, most of these technologies have now been available for at least two decades or more. So what has changed recently? The key advances in recent years have been the increase in reliability and portability of hardware devices, the connectivity between devices and the individuals using them and the power with which software can meaningfully process and store information. This has meant that information that previously required a powerful desktop computer to process and store can now be miniaturised into the smallest of portable equipment, with far greater reliability regarding memory storage and retrieval, and therefore used in ways that we could only imagine a decade ago. For example, the memory and processing capacity of most smartphones is now on par with desktop computers of old – meaning that information can be made available in real time at the source of collection in portable and even wearable devices, such as a watch. In addition, the ability to transmit information has also changed dramatically and made the communication and sharing of information much simpler. Electronic information is no longer bound to wires and cumbersome telephone cables at least over short distances, which means that information can be both transmitted and received in real time. All in all, these tremendous technological advances that continue at what seems an ever accelerating and frantic pace, have made biometrics a reality – allowing the collection of meaningful data regarding human behaviour conceivable.

This is especially relevant to psychological and psychiatric disorders where historically access to the brain has been difficult and an understanding of its properties clearly requires sophisticated assessment. Neuroimaging has provided a useful window on the brain but correlating this to phenomenology and real-world experiences has proven challenging. In this context, digital technologies are bridging this gap, making it possible not only to directly interrogate the brain, but also reliably correlate brain function with physiological parameters. However, despite these technological advances many hurdles remain. For example, being able to acquire more data means that larger datasets need to be processed and in order to identify signals of value and this is a growing challenge and an inevitable function of amassing information. Intelligent and elegant study design and the use of targeted paradigms rather than simply collecting large datasets is one way to overcome these problems. However, at the same time, having large data sets does allow for more sophisticated statistical analyses and the detection of subtle effects that would simply not be discernible otherwise.

Modern mobile technologies are also providing exciting opportunities to translate these new findings and other evidence into clinical practice, and to reach individuals, groups and even countries with limited access to mental health services. Online, text-messaging, app-based and telephone support interventions are all examples of new forms of 'connected' digital mental health care, with much potential to supplement or augment traditional face-to-face therapies. However, many questions remain regarding their quality, efficacy, cost-effectiveness and potential for harm, and the parameters by which these can or should be defined.

These and many other facets of this fast developing interface are the exciting considerations that are the focus of the papers in this special issue that has been dedicated to bringing together knowledge of the extant technologies and how they are being utilised. In this issue, researchers from across the world have been brought together so as to provide a rich and varied menu that collectively provides a comprehensive update of the status of the field. Malhi and colleagues review the emerging literature

addressing the use, and promise, of digital mood tracking technologies, whilst Sheehan et al. consider the opportunities and risks of digital technologies in mental healthcare specifically for people with intellectual disability, and Murphy et al. illustrate the potential of new technologies to improve global mental health via cross-cultural digital education. The important question of how best to evaluate simple digital mental health tools, specifically smartphone apps, is at the heart of the article by Davies and colleagues. Other contributions in this special issue provide rich examples of the potential benefits and barriers of implementing digital mental health interventions - including, crucially, users' experiences of these - in different contexts and using different technologies. Dodd et al. discuss some important lessons for design and evaluation gathered as part of trialling an online intervention for people living with Bipolar Disorder; Falconer and colleagues report the findings of a mixed methods feasibility study of an innovative Adjunctive Avatar Therapy for Mentalization Based Treatment of Borderline Personality Disorder; and MacKie at al.'s paper focuses on the experience of receiving and delivering a blended therapy of face-to-face problem solving therapy combined with a customised smartphone app in a group of suicidal men. These, and the other papers in this special issue, therefore not only showcase some of the latest research and thinking in this new and rapidly developing field, but also bring together some key lessons about how digital technologies may be exploited in the future to advance our understanding and treatment of mental health issues.