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The Use of Digital Technology and the Health and Wellbeing of Children and Young People[1]

By **Baroness Susan Greenfield**
University of Oxford, UK

As a research neuroscientist teaching medical students at Oxford for over 20 years, and now as CEO of a biotech company, Neuro-Bio, I would like to focus on how digital technology influences brain functioning – and thus thoughts, feelings and behaviour. Back in 2014, I published a book, *Mind Change*,[2] on this very topic. However, over the last five years the situation has become ever more controversial: almost daily there are statistics and stories in the media on the burgeoning screen life-style, including an addiction to games deliberately crafted to that end, as already described so eloquently by Baroness Kidron.

Nonetheless, only two weeks ago, a report from the Royal College of Paediatrics and Child Health concluded that there was no evidence that digital devices are harmful to children. In contrast to their equivalent professional bodies in Canada and the USA, the UK College argued it was unnecessary to suggest time limits for daily screen exposure, and that their counterparts in North America 'are neglecting the benefits of screen use, and focussing too much on the risks'.

But surely, we owe it to the next generation to do just that – consider the risks. Coincidentally, on the very same day this report hit the headlines, a paper was published from University College London based on a cohort of almost 11,000 young people, linking depression to use of social media. Surely, whilst such studies continue to appear and raise doubts, we should not so readily abandon the precautionary principle.

Moreover, there are now attempts to clarify more precisely the relationship between well-being and screen. For example, just last year a paper in *Preventative Medicine Reports* on over 40,000 children and adolescents showed a negative *and linear* association between screen time and decline in psychological well-being.

The Royal College does concede that screen time can indeed have a negative impact by displacing sleep and physical activity and facilitating excessive eating and bullying. But that is precisely the point, when considering the time spent by teenagers on digital media: obesity, bullying and sleep deprivation are sadly very real features of our current culture. Even more troubling is that such comments assume, wrongly, that the experience itself of living in a cyber world is neutral: as a neuroscientist I would find it hard to accept that prolonged engagement with a screen doesn't constitute a new type of input leaving its mark on the physical brain.

For the very young, products are now available such as cots and potties equipped with an inbuilt screen which, for the developing brain in particular, is hyper-stimulatory. The neurologist Richard Cytowic has documented how the brain does not possess the energy reserves for processing the urgent and intense demands now made on it, resulting in fatigue, attentional impairments, eye strain through excessive blue light, and retarded motor skills.

Aside from the basic impact on sensory processing and motor coordination, we also need to consider changes in cognition – thinking. Humans occupy more ecological niches than any other species on the planet because of the superlative ability of our brains, compared with those of any other animal, to adapt to the environment. Our brains become highly personalized by the development of unique configurations of connections between brain cells that characterize the growth of the human brain after birth, personalizing it into a uniquely individual 'mind' that is in constant dialogue with, and updated by, the environment.

Digital technology is offering an *unprecedented* environment: although the printing press, the car, the TV had a profound influence on everyone's lives, it has been after all on our *real* lives. In the 20th century, people still dated, worked, played and shopped through face-to-face interactions with each other in a three-dimensional space enriched by all five senses. Now, for the first time, you can carry out all those activities via a screen – living effectively in a parallel universe: recreation via video games, friendship via social media, and learning via search engines. Let's briefly take each in turn....

The World Health Organization and the American Paediatric Academy have both recently categorized addictive Internet Gaming as a psychiatric disorder. The neuronal mechanism of addiction is an enhanced release of the chemical messenger, dopamine, which underlies the anticipation of reward, raises arousal levels, and indeed is the final outcome of recreational drugs of addiction.

Moreover, we know that dopamine inhibits a part of the brain, the prefrontal cortex, that is particularly dominant in humans. This region becomes only fully operational in late teenage years: until then, a characteristic profile is well recognized of recklessness, short attention span and – most significantly – over-dependency on external stimulation.

A combination of an under-developed prefrontal cortex, coupled with surges of dopamine during video gaming, could result in a mind-set driven to have literally a 'sensational time'. Supporting this prediction, a study in the high impact journal *Science* demonstrated how many of the participants, college students, rather than just being left alone to think, opted instead to give themselves electric shocks.

What of social media? When you meet someone face to face, only 10 per cent of the total impact is dependent on language, whilst much depends on tone, volume of the voice, eye contact, body language, and physical touch – none of which is available via social media.

And if we don't rehearse these skills we will not be very good at them: direct social interaction will be ever-more aversive, resulting in ever-greater dependency on the screen as an intermediary and a decline in empathy, increasingly described as 'virtual autism' and the inverse of empathy, bullying.

What of learning? Two seasoned secondary school teachers in Washington, D.C., Joe Clement and Matt Miles, have recently published *Screen Schooled*,[3] a book setting out the evidence and arguments that too much screen time has resulted in students who lack focus and critical-thinking skills.

In summary, the mind-set of the mid-21st century citizen, a child growing up at the moment immersed in digital technology, might end up as follows:

- Short attention span
- Slightly adversarial
- Addictive behaviour
- Recklessness
- Low empathy and 'virtual autism'
- A fragile sense of identity
- Poor critical thought

A key factor is an over-emphasis on the sensory pull of the immediate moment, at the expense of the past and the future. Yet it is this linearity of past–present–future, beginning–middle–end, that characterizes the human thought process itself, language, sentences and so to stories, life stories and hence individual identity.

We need to promote behaviours that, instead of multi-tasking, mandate sequencing exclusively single actions in a specific order over a specific time frame: cooking, eating together, gardening, whilst perhaps the most obvious form of sequencing would be reading – ideally, from real books.

Sport is another activity that precludes multi-tasking. Moreover, physical exercise results in the production of new brain cells, 'neurogenesis', enhanced academic performance, and a reduction in stress-linked mental impairments. In addition, just walking or working in a rural environment has a positive effect.

In 1964 the writer Isaac Asimov predicted life 50 years on: 'The lucky few who can be involved in creative work of any sort will be the true elite of mankind, for they alone will do more than serve a machine.' It is ironic that excessive use of screens and social media in particular may be eroding the very talents we will need to compete with AI in the workplace in the future.

In order to thrive in our current culture we need to refocus our priority on nurturing self-confident and thoughtful individuals for whom digital devices are not the pivot of their daily life, but merely part of a more diverse tool-kit for attaining personal fulfilment – in the real world.

About the Contributor

Baroness Susan Greenfield was promoted to a professorship at Oxford University in 1996, and from 1998–2010 was Director of the Royal Institution of GB. Now CEO of a biotech company (www.neuro-bio.com) she founded in 2013 to develop a disruptive approach to Alzheimer's disease, Susan has received 32 honorary university degrees; in 2000 became Honorary Fellow of the Royal College of Physicians; and has received numerous other international awards. In 2002 she authored the Greenfield Report *SET Fair: A Report on the Retention and Recruitment of Women in Science, Engineering, and Technology*. Researching the physical basis of the mind, her own theory of consciousness, *Journey to the Centres of the Mind*, appeared in 1995, extended in her *The Private Life of the Brain* (2000). An in-depth exploration of the impact of technology on the brain appears in *Mind Change: How 21st Century Technology Is Leaving Its Mark on the Brain* (2014). Susan's latest book, *A Day in the Life of the Brain: Consciousness from Dawn 'til Dusk*, was published by Penguin in 2016.

Notes

1 This is an extended version of a speech made by Baroness Greenfield in the UK House of Lords cross-bench debate of 17 January 2019 – 'Baroness Kidron to move that this House takes note of the relationship between the use of digital technology and the health and wellbeing of children and young people'.

2 Susan Greenfield, *Mind Change: How Digital Technologies Are Leaving Their Mark on Our Brains*, Rider, London, 2014.

3 Joe Clement and Matt Miles, *Screen Schooled: Two Veteran Teachers Expose How Technology Overuse Is Making Our Kids Dumber*, Black Inc., Carlton, Vict., Australia, 2018; for an extended review, see goo.gl/t6oaMt.