*__Dr Aric Sigman__ reports on the growing evidence of excess screen use and its potentially serious negative effects on young people's mental health.*

# The downsides of being digitally native

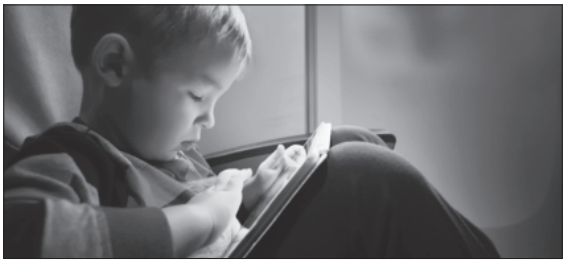
**ALTHOUGH screens are clearly with us to stay, we should now be well aware that they are far from hazard-free, as more and more evidence is indicating.**

Despite this, the amount of time that children and young people spend on discretionary (that is, non-homework) screen media has risen dramatically in recent years. New findings report screen time in children aged under two as "high"[1] while, according to Ofcom, just over a third of preschoolers, aged three to four, own their own media device, such as a tablet or games console.[2] At the other end of the youth spectrum, also according to Ofcom, the average 16–24-year-old in the UK now spends more time on media and communications than on sleeping.[3]

Consider this alarming set of figures: by the age of seven, the average child will have spent nearly one full year on discretionary screen media. By the time they reach 18, this has risen to over three years and, by the age of 80, would account for 18 years of their lives. Now, at last, health professionals and researchers are turning their attention to the relationship between the sheer amount of time spent on discretionary screen media and mental health outcomes ranging from clinical depression, body dissatisfaction and eating pathologies to screen dependency disorders.

So what do we know so far? In drawing attention to the psychological impact of digital culture, Public Health England states, "The evidence suggests a 'dose–response' relationship, where each additional hour of viewing increases the likelihood of experiencing socio-emotional problems".[4] This relationship may, in some cases, be attributable to young people with mental health problems being drawn to and spending more time on screens as a 'symptom' of their mental health problem. On the other hand, excessive use could cause or exacerbate mental health problems, leading to more screen time, which, in turn, contributes further to the existing mental health problems.

Modern screen media, whether TV, computer games, YouTube, or social media, are highly engaging, inducing people to remain sedentary for longer periods of time than they otherwise would, thus displacing other experiences that might be conducive to better mental health outcomes. For example, physical activity, strongly recognised as contributing to better mental health, is much reduced amongst heavy screen users. Yet even low



levels of exercise have been found to help prevent future depression.[5]

There is now even such an entity as 'Facebook depression'. The American Academy of Pediatrics reported on this as far back as 2011, defining it as "depression that develops when preteens and teens spend a great deal of time on social media sites, such as Facebook, and then begin to exhibit classic symptoms of depression".[6] Beyond other negatives of social media, such as intense social comparison, lies a decline in real-time face-to-face or voice-to-voice interaction with people who provide social support. This erosion of the healthy meeting of an essential emotional need may explain some of the relationship with depression.

Emotional wellbeing involving key bonding hormones is thought to be enhanced through real-time voice conversation as opposed to through instant messaging. One study that yielded telling results monitored levels of stress and bonding hormones (cortisol and oxytocin) in 68 girls, when they were put under the emotional stress of having to carry out verbal and maths tests in front of an audience. The girls, aged between 7 and 12, were randomly assigned to contact their mothers afterwards, either by instant messaging, speaking to them on the telephone or speaking with them in person. A control group was offered no interaction with their parents at all. The researchers reported, "We discovered that, unlike children interacting with their mothers in person or over the phone, girls who instant messaged did not release oxytocin; instead, these participants showed levels of salivary cortisol as high as control subjects who did not interact with their parents at all."[7]

The growing links between evening/night-time discretionary screen time and clinical depression may be partly explained by the way screens, particularly smartphones and tablets held close to the eyes in bed, may reduce the amount and quality of sleep. Most screens emit blue light, which confuses the brain into responding to what it perceives


***REFERENCES***

***1*** *Goh S N, Teh L H, Tay W R, et al (2016). Sociodemographic, home environment and parental influences on total and device-specific screen viewing in children aged 2 years and below.* BMJ Open, *doi:10.1136/bmjopen-2015-009113*

***2*** *Ofcom (2016).* Children and Parents: media use and attitudes report. *https://www.ofcom.org.uk/__data/assets/pdf_file/0034/93976/Children-Parents-Media-Use-Attitudes-Report-2016.pdf*

***3*** *Ofcom (2016). The Communications Market Report. https://www.ofcom.org.uk/research-and-data/cmr/cmr16*

***4*** *Public Health England. Impact of digital culture. Written submission to Commons Select Committee on Child and Adolescent Mental Health, CMH0085.*

***5*** *Mammen, G and Faulkner, G (2013). Physical activity and the prevention of depression.* American Journal of Preventive Medicine, *45, 5, 649–57.*

***6*** *O'Keefe, G S and Clarke-Pearson, K (2011). The impact of social media on children, adolescents and families.* Pediatrics, *127, 4.*

***7*** *Seltzer, L J, Prososki, A R et al (2012). Instant messages vs. speech: hormones and why we still need to hear each other.* Evolution and Human Behavior, *33, 1, 42–5.*

***8*** *Roberts, R E and Duong, H T (2014). The prospective association between sleep deprivation and depression among adolescents.* Sleep, *37, 2, 239–44.*

***9*** *Watson, N F et al (2014). Sleep duration and depressive symptoms: a gene-environment interaction.* Sleep, *37, 2, 351–8.*

as daytime sunlight. As a result, the brain's pineal gland then reduces the normal production of the sleep hormone melatonin, thereby disrupting sleep. Sleep deprivation has been found longitudinally to raise the risk of depression by an astonishing 300 per cent.[8] Neurobiologists suspect that sleep deprivation causes epigenetic changes in the brain, affecting the function of serotonin, and have implicated "ubiquitous technology [which] creates an environment that promotes sleep deprivation".[9]

## Screen dependency disorders

Part of the reason that the problems associated with excessive screen use have not been highlighted more quickly is that there is not, as yet, a universally accepted terminology for it. Research databases list studies and findings on internet addiction disorder, internet gaming disorder, problematic internet use, compulsive internet use, pathological video game use, video game addiction, pathological technology use, online game addiction, mobile phone dependence, social network site addiction, Facebook addiction and internet pornography addiction – which may make it appear that these are all entirely separate problems. The new draft of the World Health Organization's *International Classification of Diseases* does now list both "gaming disorder" and "gaming disorder, predominantly online", categorised as "due to addictive behaviours" and "impulse control disorders".[10]

In *DSM-5*, the latest edition of the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders*, gaming disorder is listed as a condition for future consideration as a mental disorder, as "studies suggest that when these individuals are engrossed in internet games, certain pathways in their brains are triggered in the same direct and intense way that a drug addict's brain is affected by a particular substance".[11] Given that there is a lack of agreement over the definitions of and distinctions between various screen-related disorders, I have argued that the term screen dependency disorders should be adopted as a general overview term to cover all such behaviours,[12] to remove the lack of standardisation in terminology that is impeding advances in research and treatment.[13]

## Neurobiology of addiction

Addiction is a term increasingly used to describe the growing number of children and young people engaging in a variety of different screen activities in a dependent, problematic manner. Children's brain development is influenced by their experiences, and childhood is a time of significantly greater changes in the brain's structure and connectivity. In a narrative review in the *Journal of the International Child Neurology Association*, I include empirical evidence that extensive exposure to videogame-playing during childhood may lead to structural changes in brain regions associated with addiction.[13] Digital natives, those familiar with computers and the internet from an early age, have a higher prevalence of screen-related 'addictive' behaviour that reflects impaired reward-processing and impulse-control brain mechanisms. Links are emerging between screen dependency disorders such as internet addiction and specific genetic predispositions, abnormal brain tissue and brain function. There may also be compound/secondary effects on brain development, such as the already mentioned resultant reduction in physical activity, which plays an important role in the neurological health of children, particularly in brain structure and function.

There is a significant association between pathological internet use and attention deficit hyperactivity disorder (ADHD) symptoms. Rather than 'addictive' screen time being a reflection of a pre-existing psychological problem, the relationship may be bidirectional. A study of 8–14 year olds published in *Pediatrics* concluded that "Pathological gaming seems not to be simply secondary to other disorders but to predict poorer functioning longitudinally ... Youths who became pathological gamers ended up with increased levels of depression, anxiety, and social phobia."[14]

## What therapists can do

So what might all this mean for therapists? A longitudinal study has reported that people with internet gaming disorder who received a psycho-behavioural intervention showed a highly significant change in functional connectivity between key addiction-related brain regions, along with a reduction in addiction severity, compared to controls.[15]

*DSM-5*'s provisional diagnostic criteria for an internet gaming disorder are based on how much time is spent playing the games, and how much that compromises a person's overall ability to function. Five of the following criteria would need to be met within a year: preoccupation, withdrawal symptoms, increasing tolerance, failure to reduce or stop, loss of outside interests, continuation despite negative consequences, lying about extent of use, use as means to escape adverse moods, or that the individual has lost or put at risk relationships/life opportunities because of gaming. Therapists might find it helpful to consider these points when presented with screen dependencies.

But prevention should be the main focus. Screen habits are established early and last for decades. Parents who have high levels of discretionary screen use themselves have children many times more likely than other children to do likewise. Parental monitoring and the establishing of discretionary screen time limits can reduce early exposure, shape long-term media consumption habits and may prove a major preventer of mental health problems including screen dependency disorders.[16,17] Family doctors in the US are now encouraged to take a 'media history' from patients and discuss connections between a child's health and behaviour and their screen use. Therapists, too, can provide pre-emptive guidance to families about limiting media use in the home, raising the age for screen use, reducing the degree of exposure and discouraging screens in children's bedrooms. We have ignored this pervasive lifestyle factor too long. It is time for us all to act. ■

***Dr Aric Sigman*** *is an independent lecturer in child health education for schools, medical schools and NHS doctors. He publishes papers on child health and development. See www.aricsigman.com*

***10*** *World Health Organization (2017). 6C81 Gaming disorder. Disorders due to addictive behaviours. ICD-11 Beta Draft - Mortality and Morbidity Statistics.*

***11*** *American Psychiatric Association (2013).* Internet gaming disorder fact sheet. *http://www.dsm5.org/Documents/Internet%20Gaming%20Disorder%20Fact%20 Sheet.pdf*

***12*** *Sigman, A (2017). Screen dependency disorders: a new challenge for child neurology.* Journal of the International Child Neurology Association, *http://jicna.org/index.php/journal/article/view/67*

***13*** *Griffiths, M D, Kuss, D J, Lopez-Fernandez, O and Pontes, H M (2017). Problematic gaming exists and is an example of disordered gaming: commentary on: Scholars' open debate paper on the World Health Organization ICD-11 Gaming Disorder proposal (Aarseth et al.).* Journal of Behavioral Addictions, *6, 3, 296–301.*

***14*** *Gentile, D A, Choo, H, Liau, A, et al (2011). Pathological video game use among youths: a two-year longitudinal study.* Pediatrics, *doi:10.1542/peds.2010-1353*

***15*** *Zhang, J-T, Ma, S-S, Li, C-S R et al (2016). Craving behavioral intervention for internet gaming disorder.* Addiction Biology, *doi:10.1111/adb.12474*

***16*** *Lin, C H, Lin, S L and Wu, C P (2009). The effects of parental monitoring and leisure boredom on adolescents' internet addiction.* Adolescence, *44, 993–1004.*

***17*** *Tiberio, S S, Kerr, D R, Capaldi, D M, et al (2014). Parental monitoring of children's media consumption.* JAMA Pediatrics, *168, 5, 414-21.*