

What is i-Technology Really Doing to Our Brains?

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Many of the social and emotional effects of excessive applications of digital media, otherwise known as i-technologies, or simply i-tech, have been duly noted in the popular press and professional peer reviewed journals alike. Associations with depression, anxiety, and the obsessive compulsive spectrum are pervasive, as is the perspective that other disorders have found a home or expression in excessive i-technology usage. The implication is that excessive usage, or i-addiction, may be a behavioural manifestation of some other disorder, rather than a discrete disorder. Accordingly there are findings of predictive personality characteristics and environments associated with the development of excessive usage patterns as well as rather unified findings that individuals who suffer from i-addiction are suffering from some other form of mental /psychological or social /interpersonal difficulty (see multiple works of Caplan & High; Pies, 2009; te Wildt et al., 2010; Young & Nabuco de Abreu, 2011).

There are also strong assertions that the medium may be responsible not only for the exacerbation or acceleration of DSM classifications of psychopathology, such as anxiety and mood disorders, but also the emergence of entirely i-technology dependent pathologies such as Cyberchondria and FOMO ('fear of missing out', a panic disorder associated with the need to constantly check in on digital media) or Phantom Vibration Syndrome, when one becomes obsessed with a vibrating or not vibrating phone (see Rossen, 2012). There are also surges in otherwise previously less prevalent pathological pursuits such as voyeurism and sociopathic narcissism. In an attempt to understand these emergent phenomena researchers are turning their attention to supportive functional or biological evidence. To date, multiple papers have found i-addiction, and in particular gaming addiction, to share common variation in neurochemistry, neurocircuitry and functional morphological / anatomical brain alterations as seen in other addictions; namely, process and substance disorders (see M. Swingle, 2015 for overview).

In my own research, looking electroencephalographic data (EEG), I sought to explore whether i-addiction was a discrete disorder or whether it shared common biological substrates with other disorders; namely ADHD, depression, and anxiety. I also have examined quite extensively the weight of process versus content in the addictive draw. What I now refer to as the 'what' versus 'why' debate: Is what one is doing online or on i-technology (e.g., looking at erotica or gaming) more important than why they are on line (e.g., to self soothe, alleviate anxiety, or elevate mood). My research clearly indicates that why one is excessively using i-technology (e.g., seeking social connection) overshadows what they are doing or searching (e.g., gaming)

One unique factor to i-technology research, however, is speed of evolution. In this field, one must acknowledge that we are chasing a moving object. As technology advances at lightning speed so do our usages, applications, and arguable also the relative effects on brain and behaviour.

When the effects of excessive application of i-technologies first appeared on my clinical radar between 10-15 years ago, they almost exclusively involved male children and excessive gaming. The first overt symptoms were behavioural and educational; specifically emotion deregulation and attention difficulties in school and homework tasks. Patterns on

the EEG reflected this; typically deregulation in the frontal lobes or excessive frontal or central Theta associated with attentional difficulties. Two things were of note here; first, on the EEG there were no systematic or cluster patterns common to those affected and second, it appeared that excessive usage involved the expression of liabilities common to those who had similar educational or behavioural symptoms but were not gamers.

Following epigenetic theory, excessive gaming could thus be viewed as an environmental trigger that allowed a liability to express. In sum, excessive gaming appeared to be a catalyst of attention and behavioural difficulties for school aged children and adolescents.

The primary issues for adults were relationship based; including marital strife, predominantly avoidant behaviour (e.g., hiding in i-technology over interpersonal interaction) and anger management issues (e.g., higher agitation and overt annoyance when asked to disengage).

When looking at the EEG's of affected adults, I also did not find any specific deregulation patterns. When compared to normative data bases, EEG deregulations were broadly distributed, implying any significant EEG deviation could be a liability to the disorder. Thus my findings directly supported findings of studies that found i-addiction was a co-morbid or co-occurring as opposed to a discrete disorder (see M. Swingle, 2013).

A very important differentiation, and historically of note here, is age of discovery, or the age of introduction of systematic usage, of i-technologies: In the early 2000's parents were seeking clinical assistance associated with excessive gaming for children that were discovering routine gaming between the ages of 9-15. Personal or transportable i-devices for children were not yet common, nor implicated. The population of adults affected with excessive usage patterns in this same time frame was also different. Adults seeking clinical assistance were also latent users (predominantly digital immigrants, not digital natives). Meaning, i-technologies were discovered, and became problematic, later in life. Digital immigrants as the term implies, did not grow up with i-technology, they discovered it as adults.

Today the issues are distinctly different. Children are not only discovering console gaming, but systematically using or playing with all i-technologies (i-pads, cell phones, computers, in essence all screens) at markedly younger ages. For many, i-technology is now introduced in the cradle. Pun intended, such early introduction has dramatically changed the game. Accordingly what I am starting to see on the EEG is also different. There are distinct cluster patterns in all adults and a specific Alpha deregulation associated with excessive usage in children and adults under 30. I now suspect we are no longer seeing an expression of liability, but a complete rewiring. The implication is that the medium i-technology, is more than temporarily altering systems that regulate attention, behaviour and mood it may be rewiring them. For the very young, it appears to be affecting brain development itself.

There is mounting evidence from multiple disciplines that indeed early introduction of i-technologies is affecting socio-emotional and cognitive development at its core. The primary concern for young children and infants involves i-technology's direct effects of attachment and all of the neurological systems attachment is biologically designed to foster. Quite simply, children are now being introduced to i-technologies when it is developmentally imperative that they be interacting with human caregivers. In difference to other activities, objects, or toys traditionally given to children such as stuffed animals and building blocks, it appears that when infants and young children interact with i-technology it is exclusive rather than additive. When children engage with i-technologies they do not engage with their environment nor with their caregivers to the same degree, they, like older children and adults, can become mesmerized. In terms of learning, this eclipsing of the larger environment has many implications on the thwarting of the development of observation,

curiosity and exploration; the platform from which all learning, cognitive as well as social (e.g., observing and mimicking) occurs (see multiple works of A. Gopnik) Further numerous papers, and explicitly those on language learning have demonstrated that engagement with screen based technologies reduce not expand learning (see multiple works of Khul; Zimmerman, Christakis, & Meltzoff, 2007).

The reorientation of attachment of older children from parents to peers, largely due to higher exposure to messages from media (TC) and reduced parental availability, have already been shown to have serious consequences (see Lamb & Brown, 2006; Newfeld & Mate, 2004). Equally concerning is mounting evidence that i-tech exposure in older children is connected to a reduced ability to read social cues and facial expressions (Uhis et Al., 2014). There also may be future implications here regarding the latent development of autistic-like characteristics. But very little is known of the broader effects of screens on infants. In this dearth of information, studies are being launched to understand not the brain effects per se but rather what aspects of i-technology infants are drawn to, what aspects they naturally have talent for and the alliance of the developmental stages and gestures used in I for i-tech (see Crista & Seidl, 2015). This to me reeks of marketing/product research no social, psychological or developmental research. Prior to the massive expansion of the digital age, non-human primates and the severely communicatively disabled were those for whom tablet technology was developed, and I might add very successfully. When we introduce and propagate the use of technologies that previously were reserved for non-verbal primate species or the functionally or cognitively compromised or our own, what message are we sending? And perhaps more importantly what is our purpose?

What we do know from years of developmental study and theory, is that parent-baby face to face or heart-to-heart engagement forms the core of the social engagement system from which the child and later adult will function in all subsequent relationships. Insufficient face-to-face interaction and touch can change or halt development as neuronal pathways that would normally be activated by caregiver interaction do not form. In an alternate process coined 'neuronal Darwinism' development halts as neuronal pathways that would normally be activated by caregiver interaction do not form. It is highly likely that early introduction of i-technology is now affective this most fundamental of biologically programmed adaptive systems that drives development itself. (See multiple early works of Ainsworth and Shore as well as more recent works of Siegel, and Porges, 2011).

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