Gray Matters: Too Much Screen Time Damages the Brain

Neuroimaging research shows excessive screen time damages the brain.

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"Taken together, [studies show] internet addiction (/basics/addiction) is associated with structural and functional changes in brain regions involving emotional processing, executive attention, decision making (/basics/decision-making), and cognitive (/basics/cognition) control.” --research authors summarizing neuro-imaging findings in internet and gaming addiction (Lin & Zhou et al, 2012)

But what about kids who aren't "addicted" per se? Addiction aside, a much broader concern that begs awareness is the risk that screen time is creating subtle damage even in children with "regular" exposure, considering that the average child clocks in more than seven hours a day (Rideout 2010 (http://kff.org/other/poll-finding/report-generation-m2-media-in-the-lives/)). As a practitioner, I observe that many of the children I see suffer from sensory overload, lack of restorative sleep (/basics/sleep), and a hyperaroused nervous system, regardless of diagnosis—what I call electronic screen syndrome (http://www.psychologytoday.com/blog/mental-wealth/201207/electronic-screen-syndrome-unrecognized-disorder). These children are impulsive, moody, and can't pay attention—much
like the description in the quote above describing damage seen in scans.

Although many parents (basics/parenting) have a nagging sense that they should do more to limit screen-time, they often question whether there’s enough evidence to justify yanking coveted devices, rationalize that it’s “part of our kids’ culture,” or worry that others—such as a spouse—will undermine their efforts. Digest the information below, even though it might feel uncomfortable, and arm yourself with the truth about the potential damage screen time is capable of imparting—particularly in a young, still-developing brain.

**Brain scan research findings in screen addiction:**

**Gray matter atrophy:** Multiple studies have shown atrophy (shrinkage or loss of tissue volume) in gray matter areas (where “processing” occurs) in internet/gaming addiction (Zhou 2011 (http://www.ejradiology.com/article/S0720-048X%2809%2900589-0/abstract), Yuan 2011 (http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0020708), Weng 2013 (http://www.ejradiology.com/article/S0720-048X%2813%2900073-9/abstract), and Weng 2012 (http://www.ncbi.nlm.nih.gov/pubmed/23328472)). Areas affected included the important frontal lobe, which governs executive functions, such as planning, prioritizing, organizing, and impulse control (basics/self-control) (“getting stuff done”). Volume loss was also seen in the striatum, which is involved in reward pathways and the suppression of socially unacceptable impulses. A finding of particular concern was damage to an area known as the insula, which is involved in our capacity to develop empathy (basics/empathy) and compassion for others and our ability to integrate physical signals with emotion. Aside from the obvious link to violent behavior, these skills dictate the depth and quality of personal relationships.

**Compromised white matter integrity:** Research has also demonstrated loss of integrity to the brain’s white matter (Lin 2012 (http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0030253), Yuan 2011 (http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0020708), Hong 2013 (http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0057831) and Weng 2013 (http://www.ejradiology.com/article/S0720-048X%2813%2900073-9/abstract)). “Spotty” white matter translates into loss of communication within the brain, including connections to and from various lobes of the same hemisphere, links between the right and left hemispheres, and paths between higher (cognitive) and lower (emotional and survival) brain centers. White matter also connects networks from the brain to the body and vice versa. Interrupted connections may slow down signals, “short-circuit” them, or cause them to be erratic (“misfire”).

**Reduced cortical thickness:** Hong and colleagues found reduced cortical (the outermost part of the
brain) thickness in internet-addicted teen boys (Hong 2013 (http://www.behavioralandbrainfunctions.com/content/9/1/11)), and Yuan et al found reduced cortical thickness in the frontal lobe of online gaming addicts (late adolescent males and females) correlated with impairment of a cognitive task (Yuan 2013 (http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0053055)).

**Impaired cognitive functioning:** Imaging studies have found less efficient information processing and reduced impulse inhibition (Dong & Devito 2013 (http://www.psychologicalscience.org/article/S0925-4927/2812/2900029-7/abstract)), increased sensitivity to rewards and insensitivity to loss (Dong & Devito 2013 (http://www.sciencedirect.com/science/article/pii/S0278584613001486)), and abnormal

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**Cravings and impaired dopamine (basics/dopamine) function:** Research on video games have shown dopamine (implicated in reward processing and addiction) is released during gaming (Koepp 1998 (http://www.findatherapist.com/journal/topics/566.html) and that craving or urges for gaming produces brain changes that are similar to drug cravings (Ko 2009 (http://www.journalofpsychiatricresearch.com/article/S0022-3956/2808/2900229-X/abstract). Han 2011 (http://linkinghub.elsevier.com/retrieve/pii/S0010440X10000374)). Other findings in internet addiction include reduced numbers of dopamine receptors and transporters (Kim 2011 (http://www.ncbi.nlm.nih.gov/pubmed/21499141) and Hou 2012 (http://www.hindawi.com/journals/bmri/2012/854524/)).

In short, excessive screen-time appears to impair brain structure and function. Much of the damage occurs in the brain’s frontal lobe, which undergoes massive changes from puberty until the mid-twenties. Frontal lobe development, in turn, largely determines success in every area of life—from sense of well-being to academic or career (basics/career) success to relationship skills. Use this research to strengthen your own parental position on screen management (basics/leadership), and to convince others to do the same.

For more help on managing screen-time, visit www.drdunckley.com/videogames/. For more information on how the physiological effects of electronics translate into symptoms and dysfunction—as well as how to reverse such changes—see my new book, Reset Your Child’s Brain. (http://amzn.to/1FEBEOM)

**References:**


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