

‘Uncontrolled Experiment’: How Smart Devices Are Damaging Kids Brains

As little as two hours of screen time per day can impair a child’s thinking and language skills, interfere with sleep, and increase anxiety and depression.



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Story at a glance:

- Children ages 9 to 10 who use electronic devices for seven hours or more per day exhibit premature thinning of the brain cortex, the outer brain layer that processes information from the five physical senses.
- As little as two hours of screen time per day may impact cognition, resulting in lower scores on thinking and language tests.
- Infants under the age of 2 do not effectively learn language from videos; they need live interaction.

- Babies do not transfer what they learn from the iPad to the real world. For example, the ability to play with virtual Legos does not transfer over to the skill of manipulating real Lego blocks.
- Apps and social media are designed to be addictive, and young children are far more susceptible to addiction than adults.

Most people today live in a sea of radio frequencies emitted from wireless technologies of all kinds, from routers to smartphones, tablets, baby monitors, TVs, appliances, smart meters and many more.

According to many experts, chronic, heavy exposure could have severe repercussions for our health, especially that of children, who are now exposed even before birth.

Research also suggests interaction with [social media](#), games and apps online produces a number of effects, both physical and psychological.

Heavy use of wireless devices changes kids' brain structure

In the largest long-term study of [brain development](#) and youth health in the U.S., the Adolescent Brain Cognitive Development ([ABCD](#)) Study, reveals the brains of the most [prolific users of electronic devices](#) look different compared to those who use smartphones, tablets and video games less frequently.

In all, more than 11,000 children will be followed for a decade to assess how various childhood experiences and environments affect brain development and psychological health.

As noted by the [researchers](#):

“The data will provide a resource of unprecedented scale and depth for studying typical and atypical development.”

These preliminary findings, based on the brain scans of 4,500 9- to 10-year-olds, reveal children who use electronic devices for seven hours or more each day have premature thinning of the brain cortex, the outer brain layer that processes information from the five physical senses (taste, touch, sight, smell and sound).

The exact ramifications of this anomaly are still unknown.

According to [Dr. Gaya Dowling](#), a researcher with the National Institutes of Health, which is sponsoring the \$300 million study, thinning of the cortex is thought to be part of the brain maturation process, so what these scans are showing is that this process is being sped up in children who get a lot of screen time (7-plus hours a day).

They cannot prove that the changes are definitively caused by screen time, and the full effects won't be known until years from now, as the emotional and [mental health](#) outcomes of these children are evaluated.

Still, preliminary results suggest as little as two hours of screen time per day may impact cognition, resulting in lower scores on thinking and language tests.

American Academy of Pediatrics guidelines for screen time

According to the "[Growing Up Digital](#)" report by the [American Academy of Pediatrics](#) (AAP), published in October 2015:

"The 2013 Zero to Eight study ... showed that 38 percent of infants younger than age 2 use mobile devices like smartphones. A 2015 Pew Research study reports that 73 percent of 13- to 17-year-olds have smartphones and 24 percent admit using their phones almost constantly."

The report cites data from research showing infants under the age of 1 do not effectively learn language from videos, whereas they do learn language from live interactions. Up to age 2, live presentations are far superior for language processing and learning compared to video presentations.

According to the report, "It is clear that very young children need 'contingent interaction — two-way social interchange — to promote learning."

This is also noted in the "[60 Minutes](#)" report (see video below).

Research shows that babies do not transfer what they learn from the iPad to the real world, or from two-dimensional interaction to three-dimensional reality. For example, the ability to play with virtual Legos does not transfer over to the skill of manipulating real Lego blocks.

Despite such concerns, the 2015 AAP guidelines for screen time for children relaxed its recommendations, noting that "Parents should model responsible media use," and that media

content and diversity are important considerations, but that video games can be “powerful tools for learning because they help youth work toward reward,” and “engage in experimentation.”

Previous guidelines — developed before the popularity of iPads and smartphone apps designed for young children — discouraged all screen time for children under the age of 2, and recommended a limit of two hours of screen time for kids older than 2.

The updated guidelines removed specific time limits, stressing the need for parental control instead.

Recommendations include setting limits for screen time at every age, avoiding displacement (i.e., not letting screen time dominate and take the place of face-to-face interactions and creative play), addressing digital etiquette, engaging in digital media use together and establishing definitive media-free zones and periods, such as during meals and at bedtime.

Digital media are designed to be addictive

While the AAP’s guidelines may be based on what seems to be a common sense of good parenting, the reality is that many parents have just as much trouble moderating their usage as their children.

What’s worse, young children, especially those under the age of 2, are far more susceptible to addictive behavior than older children and adults.

The fact that apps and social media are designed to be addictive adds to the challenge.

Last year, [Tristan Harris](#), a former Google product manager, revealed how smartphone apps and social media feedback are designed to get you hooked.

[Behavior patterns](#) are often etched into neural pathways, and when those behaviors are also linked to hormone secretion and physiological responses, they become even more powerful. In fact, [Harris](#) describes the reward process of using a smartphone as “playing the slot machine.” [Google](#) has discovered a way to embed that reward system into the apps on your phone.

In the video below, Harris describes the process, known in programming circles as “[brain hacking](#),” as they incorporate knowledge of neuropsychology into the development of digital interfaces that boost interaction.

For instance, getting likes on Facebook and [Instagram](#), the “streaks” on Snapchat or cute emojis on texts are all designed to boost your engagement and keep you coming back. Harris describes it as a race to the bottom of the brainstem where fear and anxiety live, two of the most powerful motivators known to advertisers. Both advertisers and computer software developers use these techniques to write code that will engage your attention.

The research discussed in the featured 60 Minute segment reveals that [addiction to smartphones and social media](#) is indeed a reality, triggering the release of dopamine — a neurochemical involved in cravings and desire that promotes impulsive and compulsive behavior.

Indeed, many, both children and adults, exhibit signs of addiction to their electronic devices.

Many even sleep with their smartphones right next to them in bed, or directly under their pillow — a trend that is bound to cause severe harm to both their mental and physical health.

Screen time linked to sleep deprivation

The radiation alone is a significant hazard and is known to disrupt sleep, but the blue light from the screen, plus the beeping and pinging when messages and other notifications come in are bound to interrupt sleep as well.

This does not even factor in the influence of [microwave radiation](#) from cellphones influencing melatonin, which regulates your sleep-wake cycle.

When your melatonin production is disrupted, it can have long-term health effects, as shown in a 2013 animal study, which assessed the effects of cellphone radiation on the [central nervous system](#).

Exposure to [cellphone radiation](#) for just one hour a day for one month caused rats to experience a period of delay before entering rapid eye movement deep sleep — a phase necessary for restorative sleep.

Another study published in 2015 found that 1.8 GHz frequencies affected rats' [circadian rhythm](#) and decreased their daily production of melatonin. Superoxide dismutase and glutathione peroxidase (which help prevent cellular damage) were also decreased. Low [melatonin](#) is used as a marker for disturbed sleep. It comes as no great surprise then that sleep deprivation among teenagers rose by 57% between 1991 and 2015. Many do not even get seven hours of sleep on a regular basis, while science reveals they need a minimum of eight and as many as 10 hours to maintain their health.

The research clearly shows that heavy computer and cellphone users are more prone to [insomnia](#). For example, one 2008 study revealed that people exposed to [radiation from their mobile phones](#) for three hours before bedtime had more trouble falling asleep and staying in a deep sleep.

Smartphone use has dramatically altered social interactions

Smartphones and tablets have also had a tremendous impact on youths' social interactions, which has significant ramifications for their psychological health.

For example, teens today are far less likely to want to get a driver's license than previous generations, and a majority of their social life is carried out in the solitude of their bedroom, via their smartphones.

As of 2015, 12th-graders spent less time "hanging out" and socializing with friends than eighth-graders did in 2009. While this makes them physically safer than any previous generation, this kind of isolation does not bode well for mental health and the building of social skills required for work and personal relationships.

In fact, today's teens are also far less prone to date than previous generations. In 2015, 56% of high school seniors dated, nearly 30% less than boomers and Gen Xers.

Not surprisingly, sexual activity has also declined — down by about 40% since 1991, resulting in a 67% drop in teen pregnancy rates.

Depression and suicide risk rises with increased screen time

Avoiding the drama of those early love experiences has not had a positive effect on emotional health, however.

Data from the annual [Monitoring the Future](#) survey reveals the more time teens spend online, the unhappier they are, and those who spend more time than average on in-person relations and activities that do not involve their smartphone are far more likely to report being “happy.” Results such as these really should come as no surprise. Spending time outdoors has been scientifically shown to dramatically improve people’s moods and significantly reduce symptoms of depression.

Interestingly, it doesn’t matter what type of screen activity is involved. They’re all equally likely to cause psychological distress.

Between 2012 and 2015, depressive symptoms among boys rose by 21%. Among girls, the rise during that same time was a whopping 50% — a truly remarkable increase in just three years’ time.

[Rates](#) of teen depression, self-harm and suicide have also dramatically risen.

Emergency room visits for self-harming behavior such as cutting have tripled among girls ages 10 to 14, and data suggest spending three hours or more each day on electronic devices raises a teen’s suicide risk by 35%.

Between 2007 and 2015, the suicide rate for 12- to 14-year-old girls rose threefold — a gender trend that can in part be blamed on a rise in cyberbullying, which is more common among girls. The suicide rate among boys doubled in that same time frame.

The issue is not entirely black-and-white, however.

Recent polling by the [Pew Research Center](#) reveals 81% of teens say social media helps them feel more connected to their friends, 69% say it helps them interact with a more diverse group of people and 68% said they feel they have people online to whom they can turn for support during rough times.

On the other hand, 45% admit they feel overwhelmed by the drama on social media and 43% feel pressured to only post content that presents them in a good light.

Still, recent research shows that [limiting social media usage](#) has a definitive, and beneficial, impact on [mental health](#).

The study in question recruited 143 undergraduate students at the University of Pennsylvania who were randomly assigned to either use social media (Facebook, Instagram and/or Snapchat) as usual for three weeks or limit their usage to 30 minutes per day.

According to the researchers:

“The limited use group showed significant reductions in [loneliness and depression](#) over three weeks compared to the control group. Both groups showed significant decreases in anxiety and fear of missing out over baseline, suggesting a benefit of increased self-monitoring.”

How electronics trigger anxiety, depression, memory problems

Aside from purely psychological factors, one of the reasons why social media use tends to raise a child’s risk for [anxiety](#) and [depression](#) has to do with the fact that smartphones emit [electromagnetic fields](#) (EMFs).

Research by professor Martin Pall, Ph.D., reveals [EMFs](#) activate [voltage-gated calcium channels](#) embedded in your cell membranes. This releases a flood of calcium ions which, through a cascade of effects, result in the creation of hydroxyl free radicals — some of the most destructive free radicals known to man.

In turn, this decimates mitochondrial and nuclear DNA, their membranes and proteins, ultimately resulting in mitochondrial dysfunction.

Your brain has the highest density of voltage-gated calcium channels in your body, which is why excessive [EMF exposure](#) is associated with depression and neurological dysfunction, including dementia.

According to [Nicholas Carr](#), author of the book, “The Shallows: What the Internet Is Doing to Our Brains,” millennials are experiencing greater problems with forgetfulness than seniors.

This is the “dark side” of neurological plasticity that allows your brain to adapt to changes in your environment. This type of plasticity is one way your brain recovers after a stroke has permanently damaged one area.

Aside from reduced [cortical thickness](#) (found in other studies besides the ABCD study), long-term [internet use](#) has also been [linked](#) to a [loss of white matter](#) and [impaired cognitive functioning](#).

It is impossible to ignore that these devices are changing your child’s brain structure, and the experience is also increasing exposure to microwave radiation and large amounts of blue light at night, thereby impacting his or her body’s ability to produce melatonin.

So, if your child or teen is showing signs of anxiety, depression or cognitive problems, please, do what you must to limit their exposure to wireless [technology](#).

Teach them more responsible usage. At the bare minimum, insist on their turning off phones and tablets at night, and not sleeping with their phone beneath their pillow or directly near their head.

Really try to minimize the presence of electronic devices in their bedroom and, to protect everyone in your household and instill the concept of “off times,” shut down your Wi-Fi at night.

As noted in “60 Minutes,” what we’re dealing with is a completely uncontrolled experiment on our children, and while it’s still too early to determine all of the ramifications, preliminary findings strongly suggest precautions are necessary to protect our children’s physical health and [mental well-being](#).

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