

**“Children who spent more of their day in front of screens were *seven times* more likely to meet the criteria for ADHD ,” says Dr. Mandhane.**



# SCREENS AND CONSEQUENCES

Researchers at CHILD's Edmonton site have taken a close-up look at screen time in preschoolers and found that quantity matters – a lot

How many screens did you grow up with? Almost certainly, a television and calculator; possibly a personal computer and digital watch. Depending on your age, the Internet didn't exist or was just ramping up.

Now, think of children growing up today: in all likelihood, there are several laptops and tablets in their homes, online games teach them the alphabet and counting, and an older sibling's smartphone winks at them from the kitchen counter. Even toddlers are awash in screen-based content from interactive apps to music and stories.



**Dr. Piush Mandhane, Associate Professor**  
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**Dr. Sukhpreet Tamana, Research Associate,**  
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Restrictions on everyday activities during the coronavirus pandemic have meant that many parents have turned to television, tablets and video games to entertain their kids more than they typically would. Parents, healthcare providers and educators may be left wondering: How much screen time is too much?

Dr. Piush Mandhane, an associate professor of pediatrics at the University of Alberta, was intrigued by this question, even before the pandemic. In 2019, he studied the [effects of screen time](#) in 2,400 young children across Canada using data from the CHILD Cohort Study (CHILD).

Launched in 2008, CHILD is an ongoing national birth cohort study that is tracking the health and development of nearly 3,500 children from before birth to the teen years and beyond. With more than 600,000 questionnaire responses and 500,000 biological samples already collected from participating families, CHILD is one of the most informative studies of its kind in the world. Dr. Mandhane leads the Edmonton site of CHILD.

Dr. Mandhane's screen time research found that, compared to children who spent less than 30 minutes per day with screens, young children who had more than two hours of screen time per day were *over seven times more likely* to meet the criteria for attention deficit hyperactivity disorder (ADHD). They were also five times more likely to exhibit unwanted behaviours such as inattention and aggression.

It was the largest study in Canada to look at the impact of screen time exposure among preschoolers – and it all started with sleep.

## An awakening hypothesis

In an [earlier study](#), Dr. Mandhane and his team discovered that infants who slept less than 12 hours over any given 24-hour period had poorer cognitive and language development at two years of age compared to infants who got more sleep. The timing of the sleep mattered too: nighttime sleep had the greatest impact. "A short nighttime sleep was associated with a 10-point drop in a child's cognitive skills," says Dr. Mandhane. "That's nearly a full standard deviation, which is quite a substantial difference."

The discovery about sleep led to a theory about screen time. Dr. Sukhpreet Tamana, a post-doctoral student working with Dr. Mandhane, noticed that data collected by CHILD included information about screen time.

"There wasn't a lot of research out there looking at screen time in preschoolers, and we wondered if screen exposure might have something to do with our sleep findings," says Dr. Tamana, who now works as a research associate at Simon Fraser University.

Looking through the data, they observed that television time and poor sleep overlapped. "Kids who watched a lot of TV went to bed later and had less sleep," she explains. "This led us to our next question: How much screen time is too much?"



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To answer the question, the researchers went back to CHILDS's vast database. Parents involved in the Study had provided detailed information about their children's screen time use – including TV, DVDs, computers, video consoles, smartphones and tablets – as well as how much time their children spent engaged in organized physical activity and how many hours their children typically slept at night.

### **"Five more minutes, Mom!"**

The researchers found that, on average, three-year-old children spent 1.5 hours a day in front of a screen, while five-year-olds spent an average of 1.4 hours a day. For both ages, the average daily screen time use exceeded Canada's [24-Hour Movement Guidelines](#).

"Among the younger kids, 42% of three-year-olds exceeded the recommendation of less than one hour of screen time per day. For five-year-olds, 13% of the children exceeded the recommendation of less than two hours of screen time per day," reports Dr. Tamana.

Parents participating in CHILDS also completed a 99-item checklist about their child's behaviour at age five, covering everything from aggressive behaviour to social withdrawal to sleep. Dr. Mandhane's team was most interested in "externalizing behaviours" – an umbrella term used to describe behaviours that reflect a lack of inhibitory control, including inattention, hyperactivity, and aggression. They also looked for clusters of responses that pointed to clinical diagnoses such as ADHD or oppositional-defiant disorder.

Using a statistical test, the team looked for connections between screen time and behaviour at age five, and considered variables such as physical activity, sleep duration, and sleep-disordered breathing in the analysis.

### **What does the research say?**

Although Dr. Mandhane had expected to find some connection between screen time and behaviour, the magnitude of the effect came as a surprise. "Children who spent more of their day in front of screens were seven times more likely to meet the criteria for ADHD," he says.

Along with behaviours typical of ADHD, anxiety and withdrawal also showed up more often in children with screen

use of two or more hours per day. Each additional increment of screen time between 30 and 120 minutes added to the risk of these behaviours.

The researchers also looked for protective factors that made behavioural problems less likely. They found that more than two hours a week of physical activity significantly reduced children's risk of behavioural problems at age five. Not just any physical activity, though. "It had to be structured physical activity, such as organized sports," says Dr. Mandhane. "Just running around or shooting hoops didn't protect children in the same way." Why structured? "We don't know for sure yet, but it's possible that the structure and routine of organized activity may help promote positive behavioural development."

A good night's sleep also offered some protection, confirming the link that Dr. Mandhane's previous research had uncovered. Specifically, children who met the recommendation of 10 hours of more of nightly sleep had a reduced risk of behavioural problems at age five, though the benefit was small compared to low screen time.

"This means we can't explain the impact of screens entirely through sleep disruption," he concludes. What could it all mean, then? "It's possible that interacting with screens affects how the brain wires itself in childhood," says Dr. Mandhane, conceding that this is speculation until further research can fill in the blanks.

For now, "we have simply shown a correlation between screen time and behavioural problems, and we cannot say for sure that one causes the other."

## Joining the "tech" conversation

The research was published by the scientific journal [PLOS ONE](#) in April 2019 and made a splash in the mainstream media. From [CBC News](#) and [The Globe and Mail](#) to [People.com](#) and [Newsweek](#), major news outlets picked up the story and invited Drs Mandhane and Tamana to comment on their findings.

The study's ripples have also extended beyond the media. A US tech company working on a new app to help children with reading and other learning tasks approached Dr. Tamana "wanting input on whether they should limit children's use of the app." Dr. Tamana invited them to consider building time limits into the software, rather than allowing children to blast

through the levels without any constraints. "I found it exciting that developers were starting to think about this – that our work was becoming part of the conversation," she says.

According to Dr. Mandhane, research like this would not be possible without CHILD's incredible database of information on children's early life exposures and later health outcomes. CHILD has collected more than 40 million datapoints and its questionnaire responses span dozens of topics, including birth factors, nutrition, sleep, environmental exposures, bullying, school performance, body image and gender self-identification, among many others.

## No guilt, just limits

Dr. Mandhane sees the screen time study as a springboard to new investigations. Questions he plans to address in future studies include: Does the timing of screen use matter? Do viewing binges have different outcomes from steady use? Does it make a difference whether the child uses screens to play games, learn about ancient history, or chat with friends? Dr. Mandhane also hopes to follow the CHILD cohort of children as they grow up, to see if the association between screen time and behaviour persists over the years.

In the meantime, he recommends that screen time be limited to less than two hours a day for young children and he regards the preschool years as "the ideal time to promote healthy relationships with screens."

In practical terms, this could mean putting timers on devices, setting rules about using screens at specific times or days, or putting screens away well before bedtime. He also encourages adults to help children balance screen time with organized physical activity.

And what to do during the pandemic, when restrictions on activities have brought many children closer to screens than ever? "Parents should not feel guilty during this time," Dr. Tamana offers. Instead, "We suggest that they set up a routine that breaks up the screen time with activities such as indoor and outdoor play, arts and crafts, games, or quiet-time activities such as reading or story time."

Even outside the context of a pandemic, the researchers recognize that screens have a significant place in modern life, especially as children get older and use screens to connect with their peers. "Screens are to today's teens what telephones were to my generation," Dr. Mandhane points out. "We can't just forbid them from using all screens." As with so many things in life, "it's a question of balance." 🌱🌱