

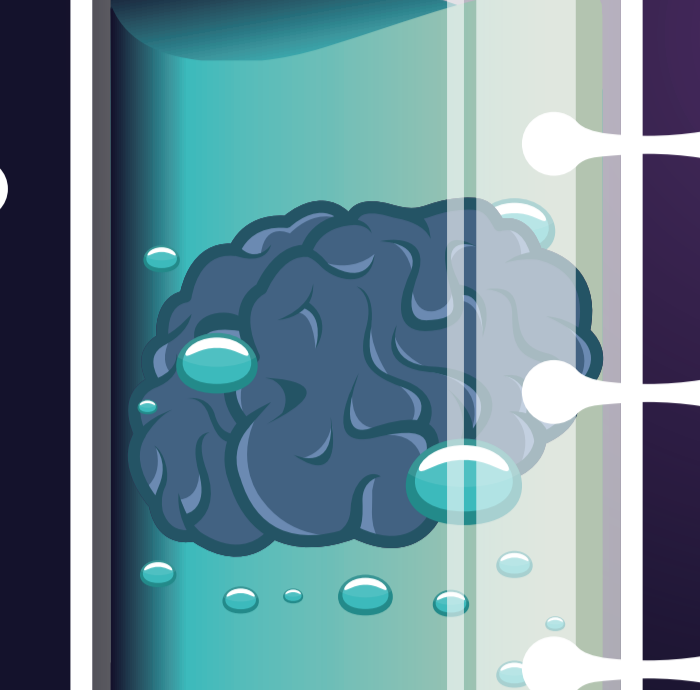
# HOW THE INTERNET CHANGES YOUR BRAIN



## THE INTERNET IS EVERYWHERE TODAY

It's inescapable. You work on it. You play on it. But the Internet offers so much more than we can find in the natural world. Nothing else can access and retrieve information as quickly as the Internet, and that's what makes it

### SUPERNORMAL



## THE INTERNET IS A SUPERPOWER

A supernormal phenomenon gets a stronger response from the brain than anything natural. Supernormal stimuli warp your decision-making process by playing on biological and evolutionary needs.

### JUNK FOOD

plays on your biological need for sugar and fat.

### THE INTERNET

is based around finding and retrieving information instantly.

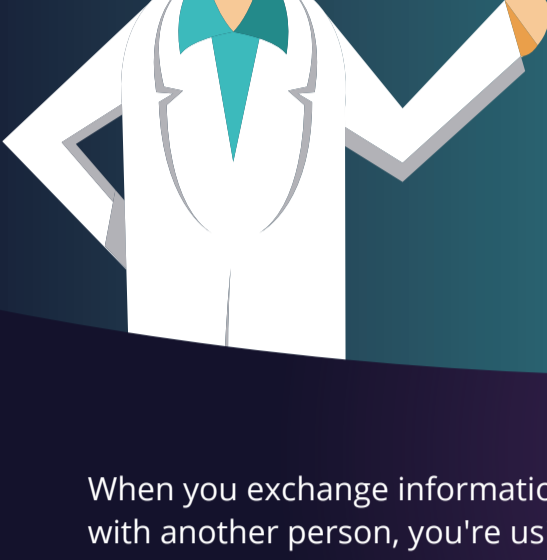
### IN OTHER WORDS

Much like how your body can't handle too much junk food, your brain is unprepared for even the most basic Internet functions, like searching, blogging, and tweeting.

## Supernormal Google

Dr. Adrian F. Ward classifies the Internet as supernormal partly because of its effects on

### TRANSACTIVE MEMORY



"The Internet - a supernormal stimulus - seems to outperform all other external storage devices, potentially leading people to offload responsibility for the vast majority of information to this single digital resource." - Ward, 2013

When you exchange information with another person, you're using transactive memory. Today, we often exchange with the Internet instead of our peers.

Transactive memory is based on the criteria of expertise and availability. The Internet easily beats an individual person.

The Internet is also immune to most causes of unavailability, including the most permanent - **DEATH.**



When we use the Internet, we don't use our memories, and we make it fill in the gaps for us. Drs. Betsy Sparrow, Jenny Liu, and Daniel Wegner call this the **GOOGLE EFFECT.**

### We let the Internet "remember" information for us because:

1. It's easier than remembering it ourselves, and
2. The Internet already "knows" almost everything.

THAT MEANS IF EITHER **THE INTERNET** OR JUST **GOOGLE** EVER GOES DOWN, WE NOT ONLY LOSE OUR MAIN TRANSACTIVE MEMORY PARTNER, **WE LOSE A TON OF MEMORIES.**

Still, that's not the biggest change the Internet makes in our brains. To see the more substantial changes, you have to dig deeper and consider the children.



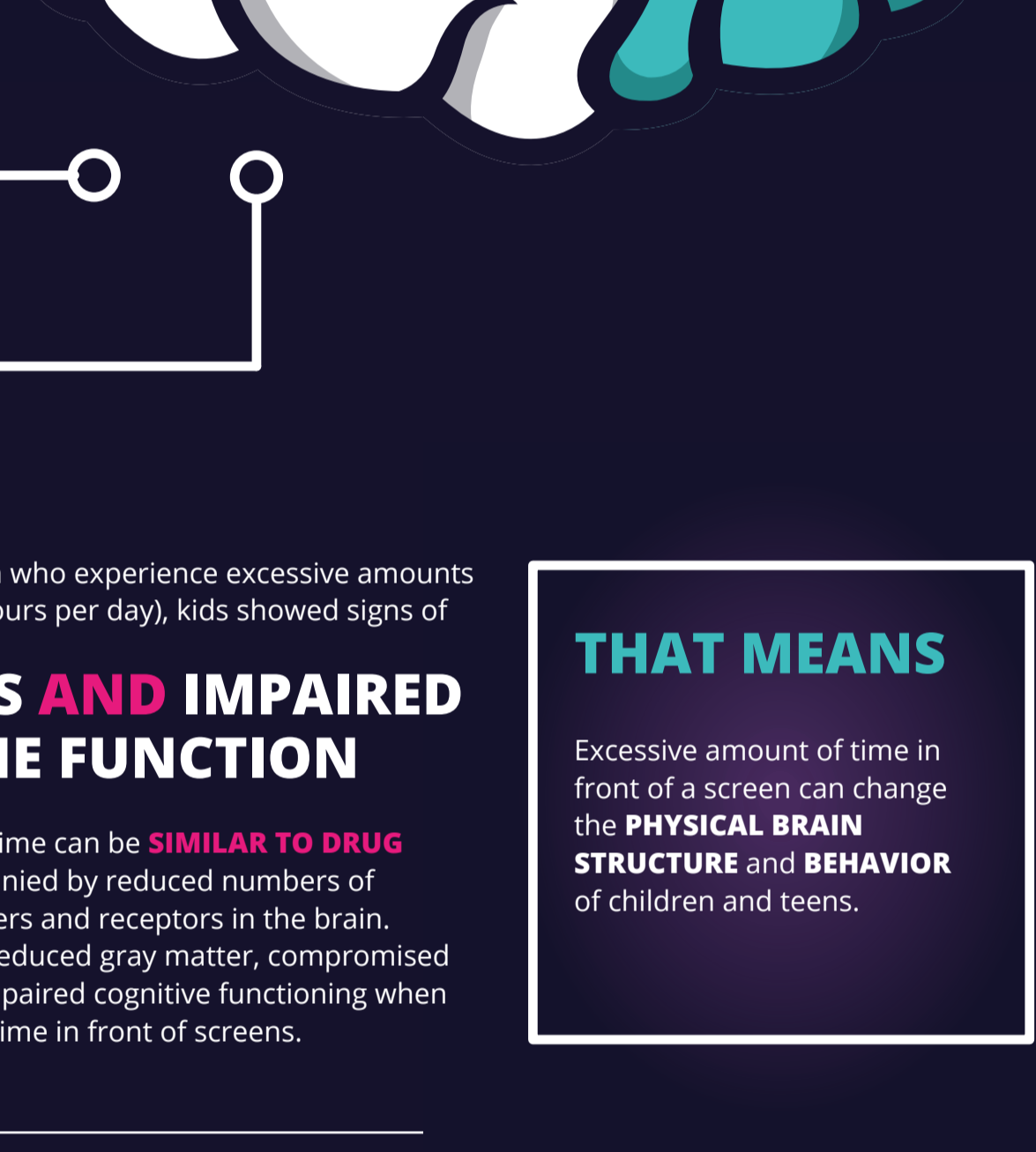
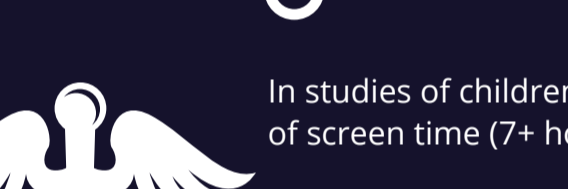
## KIDS AND THE INTERNET

The brain significantly changes as you grow. Specifically, your frontal lobe - the area of the brain responsible for motivation, attention, short-term memory, and planning - changes dramatically from puberty to your mid-twenties.

### YOUR FRONTAL LOBE ALSO RELEASES

### DOPAMINE

Dopamine makes you feel pleasure. Exploiting it with drugs, alcohol, and other stimuli can lead to addiction.



In studies of children who experience excessive amounts of screen time (7+ hours per day), kids showed signs of

### CRAVINGS AND IMPAIRED DOPAMINE FUNCTION

Cravings for screen time can be **SIMILAR TO DRUG CRAVINGS** accompanied by reduced numbers of dopamine transporters and receptors in the brain. Children also show reduced gray matter, compromised white matter, and impaired cognitive functioning when spending too much time in front of screens.

### THAT MEANS

Excessive amount of time in front of a screen can change the **PHYSICAL BRAIN STRUCTURE** and **BEHAVIOR** of children and teens.

### BUT WAIT - THERE'S MORE.



## NETAHOLICS ANONYMOUS

Internet addiction disorder (IAD) is a controversial diagnosis. Dr. Ivan Goldberg first proposed the idea in the 90s as a hoax, but several of his colleagues actually believed they had the disorder. Since then, it's taken on a life of its own.

**Today, as many as 18.5% OF AMERICANS AND EUROPEANS** fit the criteria for IAD. Still, Internet addiction is more frequently studied in terms of **VIDEO GAMES.**

Online gaming is unbearably popular among the world's youth, particularly in Asia. Gaming is so popular that an estimated

### 24 MILLION

children in China fit the criteria for Internet gaming addiction (IGA).

Internet gaming addiction is listed in the **Diagnostic and Statistical Manual of Mental Disorders (DSM-V)** as requiring additional research, but it's already accepted and treated in several Asian countries, including South Korea.

Children affected by IGA are at risk for the same impairment as children who spend a lot of time in front of screens, but the effects are magnified. IGA can also affect the development of the insula, the part of the brain that develops **EMPATHY.**

A gaming addict's brain is **STRUCTURALLY DIFFERENT** from a non-addicted brain. In fact, it **PHYSICALLY SHRINKS.**

Given that online gaming is now a **NATIONAL PASTIME** in South Korea, gaming addiction has become a public health concern. Roughly **24% OF DIAGNOSED ADDICTS** are hospitalized as **MORE PLAYERS** spend **MORE TIME GAMING** to keep up with the best.

The potential side effects of this level of screen time and gaming are unknown because **THEY'VE NEVER HAPPENED BEFORE.**



## POWER USERS

Even for Internet power users who aren't "addicts," there are still possible consequences from too much time online.

### DEPRESSION

Nearly 10% of all teens report symptoms consistent with depression. For youths already in danger of self-harm or suicide, excessive Internet use can

### MAKE THOSE SYMPTOMS WORSE.

In fact, habits like **SHOPPING, SOCIAL NETWORKING, CHATTING, LATE-NIGHT USE** and even **WATCHING VIDEOS** can amplify the symptoms of depression.

According to Dr. Raghavendra Kotikalapudi, the most likely reason these habits exacerbate depression is because:

People socialize online instead of in person, and it actually isolates them more. It's also possible that excessive Internet use could normalize self-harm and discourage seeking help through these feelings of isolation.

"...students replace real-life interactions with online socializing, leading to increased social isolation and anxiety in their physical environments." - Kotikalapudi, et al, 2012



## POOR ATTENTION

The changes in children's brains caused by excessive screen time affect them with

### SENSORY OVERLOAD LACK OF RESTORATIVE SLEEP HYPER-AROUSAL NERVOUS SYSTEM

which makes kids

### IMPULSIVE, MOODY, and INATTENTIVE.

These symptoms can carry over from personal life into education as well.



## SCHOOL DIFFICULTIES

Children who excessively use the Internet may have a hard time in school.

### IMPAIRED PROCESSING

can make learning difficult.

### IRRITABILITY

can make socializing hard.

### DEPRESSION

can make school feel isolating.

While the Internet can provide an escape from those feelings, too much use can ultimately

### MAKE THEM STRONGER.

# WHAT'S THE VERDICT?

Excessive Internet use has observable side-effects, but it's still controversial whether someone can be "addicted" to the Internet. However, our use as a society has impacted our daily lives and how we operate beyond any natural phenomenon, which truly makes the Internet

### SUPERNORMAL

### SOURCES:

Adrian F. Ward | Daniel Wegner | University of Washington | National Institute of Mental Health | New Yorker | Psychology Today | Business Insider | Betsy Sparrow | Raghavendra Kotikalapudi | Missouri University of Science and Technology | DSM-V | Newsweek | Academic Earth | PC World | Jenny Liu | Harvard University | New York Times | Scientific American | Adweek