DIGITAL ADDICTION:
A 21st Century Public Health Crisis

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Hospital • Research • Foundation

UW Medicine
School of Medicine
EXECUTIVE FUNCTION

- “Highest Order” thinking
- Pre-frontal cortex
THREE COMPONENTS OF EXECUTIVE FUNCTION

SELF-CONTROL
The ability to stay focused and resist temptation
THREE COMPONENTS OF EXECUTIVE FUNCTION

SELF-CONTROL
The ability to stay focused and resist temptation

WORKING MEMORY
The ability to hold information in mind while mentally working with it
THREE COMPONENTS OF EXECUTIVE FUNCTION

SELF-CONTROL
The ability to stay focused and resist temptation

WORKING MEMORY
The ability to hold information in mind while mentally working with it

COGNITIVE FLEXIBILITY
The ability to apply something learned in one context to another and to modify it accordingly
THREE COMPONENTS OF EXECUTIVE FUNCTION

**SELF-CONTROL**
The ability to stay focused and resist temptation

**WORKING MEMORY**
The ability to hold information in mind while mentally working with it

**COGNITIVE FLEXIBILITY**
The ability to apply something learned in one context to another and to modify it accordingly
3. Find $x$.

Here it is

**Simplicity**

The simplest solutions are often the cleverest
They are also usually wrong
STANFORD MARSHMALLOWS TEST

- Dunedin longitudinal data
- 1000 children followed from birth to 30 years
- Observational but very well controlled
- Excellent follow-up
Executive Function Skills Build into Early Adult Years

Perry Preschool Project

• 1962-1967 Randomized Trial in Ypsilanti MI
• Two curricula for 128 low income 3-4 yr old children
  – Standard vs “Enhanced”
• “Enhanced” class focused on non-cognitive skills
  – Field Trips (orchards, bakeries, airport)
  – Dramatic Play
• No IQ differences at age 10
As Older Children/Adults

• High School Graduation (65% vs 45%)
• Out of wedlock birth (57% vs 83%)
• Arrest rate (32% vs 48%)
• Jail or Prison (28% vs 52%)
• Higher monthly income ($2712 vs $1911)
“I wake up in cold sweats every so often thinking, what did we bring to the world?”

TONY FADELL, “FATHER” OF THE IPAD
“So, your kids must love the iPad? I asked Mr. Jobs, trying to change the subject. The company’s first tablet was just hitting the shelves. ‘They haven’t used it,’ he told me. We limit how much technology our kids use at home.”

Steve Jobs Was a Low-Tech Parent
Nick Bilton, SEPT. 10, 2014
NEW YORK TIMES
If atomic bombs are to be added as new weapons to the arsenals of a warring world, or to the arsenals of nations preparing for war, then the time will come when mankind will curse the names of Los Alamos and of Hiroshima.

J. ROBERT OPPENHEIMER
DIGITAL ADDICTION

Lee Seung Seop
1977-2005
Addictions

• Pharmacologic (e.g. opioids, alcohol, nicotine)
• Behavioral (e.g. gambling, sex)
Julio during training
Julio once “trained”
## Presence of Device in Bedroom & Sleep Problems

<table>
<thead>
<tr>
<th>Source</th>
<th>Access to a Device</th>
<th>No Access to a Device</th>
<th>Odds Ratio (95% CI)</th>
<th>Reduction in Odds</th>
<th>Increase in Odds</th>
<th>Weight, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buxton et al, 2015</td>
<td>108</td>
<td>238</td>
<td>1.66 (1.24-2.22)</td>
<td>-</td>
<td>-</td>
<td>21.6</td>
</tr>
<tr>
<td>Chahal et al, 2013</td>
<td>229</td>
<td>577</td>
<td>1.43 (1.19-1.72)</td>
<td>-</td>
<td>-</td>
<td>26.0</td>
</tr>
<tr>
<td>Gamble et al, 2014</td>
<td>376</td>
<td>884</td>
<td>2.00 (1.50-2.67)</td>
<td>-</td>
<td>-</td>
<td>21.7</td>
</tr>
<tr>
<td>Gradisar et al, 2013</td>
<td>45</td>
<td>61</td>
<td>2.16 (1.07-4.37)</td>
<td>-</td>
<td>-</td>
<td>9.1</td>
</tr>
<tr>
<td>Kubiszewski et al, 2013</td>
<td>55</td>
<td>221</td>
<td>1.20 (0.70-2.07)</td>
<td>-</td>
<td>-</td>
<td>12.6</td>
</tr>
<tr>
<td>Lemola et al, 2015</td>
<td>118</td>
<td>287</td>
<td>4.54 (2.24-9.19)</td>
<td>-</td>
<td>-</td>
<td>9.0</td>
</tr>
<tr>
<td>Total events</td>
<td>931</td>
<td>2268</td>
<td>1.79 (1.39-2.31)</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
</tbody>
</table>

Heterogeneity: $\tau^2 = 0.06; \chi^2 = 13.77; P = .02; I^2 = 64%$

Test for overall effect: $z = 4.51; P < .001$

---

Carter et al. Association Between Portable Screen-Based Media Device Access or Use and A Systematic Review and Meta-analysis, *JAMA Pediatrics* 2016
DSM V (2013)

- Internet gaming disorder “in need of further study”
Internet Gaming Disorder DSM 5

5 of following in past year:

• Preoccupation with gaming
• Withdrawal symptoms when gaming is taken away or not possible (sadness, anxiety, irritability)
• Tolerance, the need to spend more time gaming to satisfy the urge
• Inability to reduce playing, unsuccessful attempts to quit gaming
Internet Gaming Disorder DSM 5 (cont.)

- Giving up other activities, loss of interest in previously enjoyed activities due to gaming
- Continuing to game despite problems
- Deceiving family members or others about the amount of time spent on gaming
- The use of gaming to relieve negative moods, such as guilt or hopelessness
- Risk, having jeopardized or lost a job or relationship due to gaming
WHO Perspective

• International Classification of Diseases* (ICD-11), “Gaming Disorder” will be identified as a new disorder.
Epidemiology of “Gaming Disorder”

- Global prevalence estimates vary from 5-12 %
- More common in Asian countries
- More common in children with ADHD
Focus on “Gaming” is too limited

• Dated: What about Apps & Social Media?
• Gendered: Boys prefer games; Girls prefer social media
• Prefer “Digital Addiction”
If you can read this, somebody stole my iPhone
Digital Addiction

• Fear of Missing Out “FOMO”
• No Mobile Phone Phobia
• Traditionally viewed as problem of adolescence and adults
B F Skinner
BF Skinner Revisited

- Reward behavior → Pushing lever gets Pellet
  - Clicking mouse gets points/objects
- Make reward unpredictable → Not every pull gets a pellet
  - Valued objects appear at random
- Punish avoidance → Shock for not pushing lever
  - Penalized for leaving
Slot Machine 101

- Slot machines designed to win for house
- Time on Device = $ to house
- Keep losers feeling they are close to winning
- Apps aren’t playing with real $ so they can afford to “pay” more than they “get”
Zone of Proximal Development

I can’t do it 😞

I can do it with help!

I can do it! 😊
Psychology of Optimal Experience
Game Elements for Flow

- “Free” to play (low barrier to entry)
- “Safe” modes
- Starts easy and ramps up *intelligently*
Each contingency is an arrangement of time, activity, and reward, and there are an infinite number of ways these elements can be combined to produce the pattern of activity you want from your players.
Evolution of Gaming Business Model
FORTNITE

SAUVER LE MONDE

BATTLE ROYALE

Joie à 100 joueurs

Un Battle Royale à 100 en Jd.
La progression du mode Jt n'affecte pas Battle Royale.
• ~200 million users
• Free to play but made at least $1.2 billion so far by “V-bucks”
• Untold amount via data selling
“Gamification” of “Friendship”

Snapchat Streak
<table>
<thead>
<tr>
<th>BEST FRIENDS</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>brooke</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>graysonnnnn</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>ALEX</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Alexa</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>HOMEGIRL SPIC…</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Princess lilly</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Hannah Sorenson</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RECENTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ciara</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Lydia</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>ZZ THE BESTIE</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>
“If you lose the streak, you lose the friendship. Some people I don’t live next to, so if I didn’t have the snap streak going, I wouldn’t talk to them. Maybe if my streak with them ended, I’d start a new one, but it depends on how much I like them.”

Peter Santa Ana, 18 years old Honolulu

“In Snapchat, streaks develop a level of friendship between people. The longer your snap streak is, the better friends you are.”

Catie Clarke, 13 years old, Cape Cod
NEVER LOSE A STREAK AGAIN
Contact Us

What can we help you with?

- My account login
- My Snapchat isn't working
- I have a Filter or Lens question
- I have a Spectacles question
- I have a Snap Store question
- I have a privacy question
- Report a safety concern
- My Snapstreaks disappeared
- I have a business concern
- I have a Bitmoji question
- I have feedback
US Time Spent By App Category

- **8% BROWSER**
  - Browser 8%
- **92% APP**
  - Facebook 19%
  - Other 8%
  - Sports 2%
  - News & Weather 3%
  - Productivity 9%
  - Lifestyle & Shopping 5%
  - Utilities 9%
  - Gaming 11%
  - Music, Media & Entertainment 15%
  - Messaging/Social 12%
  - YouTube 3%
  - Snapchat 2%

5 HOURS

Dec 2016
Addiction

- Nurture is ubiquitous

At Risk = High Risk
Newcastle airport 1990

I’m so F+**ing bored!!!!
**PROBLEMATIC AND RISKY INTERNET USE SCREENING SCALE (PRIUSS)**

Please answer the questions below based on how you have felt and conducted yourself regarding your Internet use over the past 6 months. Please do your best to interpret these questions as they apply to your own experiences and feelings.

When considering your Internet use time, think about any time you spend online, whether you are using a computer or a mobile device. Do not include time you spend texting unless you are using text messages to interact with an online application such as Facebook or Twitter.

Place an X in the box which best describes your answer.

**How often ...**

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. do you choose to socialize online instead of in-person?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. do you have problems with face to face communication due to your Internet use?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. do you experience increased social anxiety due to your Internet use?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. do you fail to create real-life relationships because of the Internet?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. do you skip out on social events to spend time online?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. do your offline relationships suffer due to your Internet use?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. do you feel irritated when you’re not able to use the Internet?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. do you feel angry because you are away from the Internet?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. do you feel anxious because you are away from the Internet?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. do you feel vulnerable when the Internet isn’t available?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Smartphone Initiation

• Begin with “Why”?
• Privilege not a right
• Phone is yours, they use it
• Sign a “contract”
THE FAMILY SCREEN TIME CONTRACT

1. School Nights & Weeknights:
Our family shuts down all our devices at ______ o’clock. The devices remain off until the next morning. Devices will not be turned back on until everyone has finished breakfast, or

2. Weekends & Holidays
Our family limits screen time on weekends and holidays to __________.

3. Travel Vacations
After arriving at our destination, everyone in our family limits screens to ______ minutes in the evening. We leave our devices in our hotel or van as hiking, going to the beach, cycling, etc. If needed, one device or emergency calls.

4. Screen Time Blackouts
Our family does not use our devices when we have: (check all)
- Meals together
- Family gatherings
- Playdates

Add your personal family guidelines here: ________________

5. Device Storage & Charging
Our family does not store or charge tech devices in our bedroom communal space, which is our ________________.

6. Screen Time Privilege
Devices aren’t available after school until homework and chores:
- Making beds
- Tidying up rooms
- Doing dishes

Add your additional family chores here: ________________

7. Alternatives to Screen Time:
Our family recognizes that too much screen time is unhealthy. Activities such as: (check at least three)
- Exercise
- Musical instruments
- Dance
- Reading for pleasure

Add your own special activities here: ________________

Family Media Agreement

I, ________________________, will:

- **Take care.**
  - I will take care of the device I’m using and tell my family if it’s broken, stolen, or lost. As a family, we have agreed on the consequences if I lose or break a device, and I understand those consequences.
  - Unless I have paid for a device with my own money or it was a gift, I understand that the device belongs to the family member(s) who bought it.

- **Stay safe.**
  - I will not create accounts or give out any private information—such as my full name, date of birth, address, phone number, or photos of myself—without my family’s permission.
  - I will not share my passwords with anyone other than my family. I will ask my family to help me with privacy settings if I want to set up devices, accounts, or profiles.
  - If anyone makes me feel pressured or uncomfortable or acts inappropriately toward me online, I will stop talking to that person and will tell a family member or other trusted adult about it.

- **Think first.**
  - I will not bully, humiliate, or upset anyone online—whether through sharing photos, videos, or screenshots, spreading rumors or gossip, or setting up fake profiles—and I will stand up to those who do.
  - I know that whatever I share online can spread fast and far. I will not post anything online that could harm my reputation.
  - Whenever I use, reference, or share someone else’s creative work online, I will give proper credit to the author or artist.
  - I know that not everything I read, hear, or see online is true. I will consider whether a source or author is credible.

Sign here

I, ________________________, have read the following document and agree to the above rules. I understand that if I have any questions, I should talk to my parents face-to-face.

[Signature]

<table>
<thead>
<tr>
<th>Initial here:</th>
<th>Initial here:</th>
<th>Initial here:</th>
</tr>
</thead>
</table>

[Children's 4 Foundation]
Treatment

• Hundreds of treatment centers in Asia
• First US inpatient center, reSTART, founded 2009 outside Seattle
• 8-12 weeks
• Many additional ones since
• Long term effectiveness data lacking
• Risk of relapse likely high given societal expectations
Technology heal thyself

Moment

Put down your phone and get back to your life

Download on the App Store

Looking for Android?

Moment gives you back your time. We’ve all found ourselves lost in our phones,
Apple Screen Time

SCREEN TIME
Today at 11:58 AM

Dimitri iphone 7s

3h 13m 1h 14m above average

Produ... Social Ne... Reading & Reference
1h 59m 42m 4m

Downtime
Apple Cracks Down on Apps That Fight iPhone Addiction

April 27th 2019
Infants may be at Great Risk

• Born wired to try and understand causality
• Violation of expectation paradigm
Cause and Effect
Question

I did it!!!!!!
Violation of Expectation
Expectation
Violation of Expectation
Response to Behavior Request
Response to Behavior Request
MUSIC SPARKLES

14 Adorable Musical Instruments Inside!
Response to Behavior Request
peg's parade

play
Response to Behavior Request
RESPONDING TO BEHAVIORAL REQUESTS

- Real: 66.7%
- App: 60.7%
- App Program: 46.7%
TOP 10 PRACTICAL TIPS

START EARLY
TOP 10 PRACTICAL TIPS

START EARLY

10. LOW-RISK GAMES
TOP 10 PRACTICAL TIPS

10. Start Early
9. Self-Monitoring
8. Low-Risk Games
7.
6.
TOP 10 PRACTICAL TIPS

10. Low-risk games

09. Start early

08. Self-monitoring

07. Digital curfew

06.
TOP 10 PRACTICAL TIPS

10. START EARLY
09. LOW-RISK GAMES
08. SELF-MONITORING
07. DIGITAL CURFEW
06. SMARTPHONE CONTRACT
TOP 10 PRACTICAL TIPS

DAILY SCREEN-FREE TIME
TOP 10 PRACTICAL TIPS

DIGITAL HOLIDAYS

05

04

03

02

01

DAILY SCREEN-FREE TIME
TOP 10 PRACTICAL TIPS

01
02
03
04
05

DIGITAL HOLIDAYS

DAILY SCREEN-FREE TIME

CULTIVATE MINDFULNESS
TOP 10 PRACTICAL TIPS

DIGITAL HOLIDAYS

05

DAILY SCREEN-FREE TIME

04

03

CULTIVATE MINDFULNESS

SET & ENFORCE LIMITS

02

01
TOP 10 PRACTICAL TIPS

05
DIGITAL HOLIDAYS

04
SET & ENFORCE LIMITS

03
CULTIVATE MINDFULNESS

02
DAILY SCREEN-FREE TIME

01
BE A GOOD ROLE MODEL
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NIH

HEARST FAMILY FOUNDATION
Thank You !
EXTRA SLIDES