***Irresistible: The Rise of Addictive Technology and the Business of Keeping Us Hooke-* Adam Alter**

**Prologue: Never Get High On Your Own Supply**

In late 2010, Steve Jobs told *New York Times* journalist Nick Bilton that his children had never used the iPad. “We limit how much technology our kids use in the home.” Bilton discovered that other tech giants imposed similar restrictions. Chris Anderson, the former editor of *Wired*, enforced strict time limits on every device in his home, “because we have seen the dangers of technology first- hand.” His five children were never allowed to use screens in their bedrooms. Evan Williams, a founder of Blogger, Twitter, and Medium, bought hundreds of books for his two young sons, but refused to give them an iPad. And Leslie Gold, the founder of an analytics company, imposed a strict no-screen-time-during-the-week rule for her kids. She softened her stance only when they needed computers for schoolwork. Walter Isaacson, who ate dinner with the Jobs family while researching his biography of Steve Jobs, told Bilton that, “No one ever pulled out an iPad or computer. The kids did not seem addicted at all to devices.” It seemed as if the people producing tech products were following the cardinal rule of drug dealing: never get high on your own supply.

This is unsettling. Why are the world's greatest public technocrats also its greatest private technophobes? Can you imagine the outcry if religious leaders refused to let their children practice religion? Many experts both within and beyond the world of tech have shared similar perspectives with me.

Greg Hochmuth, one of Instagram’s founding engineers, realized he was building an engine for addiction. “There's always another hashtag to click on,” Hochmuth said. “Then it takes on its own life, like an organism, and people can become obsessive.” Instagram, like so many other social media platforms, is bottomless. Facebook has an endless feed; Netflix automatically moves on to the next episode in a series; Tinder encourages users to keep swiping in search of a better option. Users benefit from these apps and websites, but also struggle to use them in moderation. According to Tristan Harris, a “design ethicist,” the problem isn't that people lack willpower; it's that “there are a thousand people on the other side of the screen whose job it is to breakdown the self-regulation you have.”

These tech experts have a good reason to be concerned. Working at the far edge of possibility, they discovered two things. First, that our understanding of addiction is too narrow. We tend to think of addiction as something inherent in certain people- those we label *addicts*. Heroin *addicts* in vacant row houses. Chain-smoking nicotine *addicts*. Pill-popping prescription-drug *addicts*. The label implies that they're different from the rest of humanity. They may rise above their addictions one day, but for now they belong to their own category. In truth, addiction is produced largely by environment and circumstance. Steve Jobs knew this. He kept the iPad from his kids because, for all the advantages that made them unlikely substance addicts, he knew they were susceptible to the iPad’s charms. These entrepreneurs recognize that the tools they promote- engineered to be irresistible- will ensnare users indiscriminately. There isn't a bright line between addicts and the rest of us. We're all one product or experience away from developing our own addictions.

Bilton’s tech also discovered that the environment and circumstance of the digital age are far more conducive to addiction than anything humans have experienced in our history. In the 1960s, we swam through waters with only a few hooks: cigarettes, alcohol, and drugs that were expensive and generally inaccessible. In the 2010's, those same waters are littered with hooks. There’s the Facebook hook. The Instagram hook. The porn hook. The email hook. The online shopping hook. And so on. The list is long- far longer than it's ever been in human history, and we're only learning the power of these hooks.

Bilton’s experts were vigilant because they knew they were designing irresistible technologies. Compared to the clunky tech of the 1990s and early 2000s, modern tech is efficient and addictive. Hundreds of millions of people share their lives in real time through Instagram posts, and just as quickly those lives are evaluated in the form of comments and likes. Tech offers convenience, speed, and automation, but it also brings large costs.

The people who create and refine tech, games, and interactive experiences are very good at what they do. They run thousands of tests with millions of users to learn which tweaks work and which ones don't- which background colors, fonts, and audio tones maximize engagement and minimize frustration. As an experience evolves, it becomes an irresistible, weaponized version of the experience it once was. In 2004, Facebook was fun; in 2021, it's addictive.

Addictive behaviors have existed for a long time, but in recent decades they’ve become more common, harder to resist, and more mainstream. These new addictions don't involve the ingestion of a substance. They don't directly introduce chemicals into your system, but they produce the same effects because they’re compelling and well-designed. Some, like gambling and exercise, are old; others, like binge-viewing and smartphone use, are relatively new. But they've all become progressively more difficult to resist.

I spoke to several clinical psychologists who described the magnitude of the problem. “Every single person I work with has at least one behavioral addiction,” one psychologist told me. “I have patients who fit into every area: gambling, shopping, social media, email, and so on.” She described several patients, all with high-powered professional careers, earning six figures, but deeply hobbled by their addictions. “One woman is very beautiful, very bright, and very accomplished. She has two master’s degrees and she's a teacher. But she's addicted to online shopping, and she's managed to accumulate $80,000 in debt. She's managed to hide her addiction from almost everyone she knows.” This compartmentalization was a common theme. It's very easy to hide behavioral addictions- much more so than for substance abuse. This makes them dangerous, because they go unnoticed for years.”

“The impact of social media has been huge,” a second psychologist told me. “Social media has completely shaped the brains of the younger people I work with. One thing I am often mindful of in a session is this: I could be five or ten minutes into a conversation with a young person about the argument they have had with their friend or girlfriend, when I remember to ask whether this happened by text, phone, on social media, or face-to-face. More often the answer is, ‘text or social media.’ Yet in their telling of the story, this isn't apparent to me. It sounds like what I would consider a ‘real,’ face-to-face conversation. I always stop in my tracks and reflect. This person doesn't differentiate various modes of communication the way I do… the result is a landscape filled with disconnection and addiction.”

In many respects, substance addictions and behavioral addictions are very similar. They activate the same brain regions, and they’re fueled by some of the same basic human needs: social engagement and social support, mental stimulation, and a sense of effectiveness. Strip people of these needs and the more likely to develop addictions to both substances and behaviors.

So what are the solutions? How do we coexist with addictive experiences that play such a central role in our lives? Millions of recovering alcoholics manage to avoid bars altogether, but recovering Internet addicts are forced to use email. You can't apply for a travel visa or a job, or begin working, without an email address. Fewer and fewer modern jobs allow you to avoid using computers and smartphones. Addictive tech is part of the mainstream in a way that addictive substances never will be. Abstinence isn't an option, but there are other alternatives. You can confine addictive experiences to one corner of your life, while courting good habits that promote healthy behaviors.

The age of behavioral addiction is still young, but early signs point to a crisis. Addictions are damaging because they crowd out other essential pursuits, from work and play to basic hygiene and social interaction. The good news is that our relationships with behavioral addiction aren't fixed. There's much we can do to restore the balance that existed before the age of smartphones, emails, wearable tech, social networking, and on-demand viewing. The key is to understand why behavioral addictions are so rampant, how they capitalize on human psychology, and how to defeat the addictions that hurt us, and harness the ones that help us.

**PART 1: What is Behavioral Addiction and Where Did It Come From?**

**Chapter 1: The Rise of Behavioral Addiction**

A couple of years ago, Kevin Holesh, an app developer, decided that he wasn't spending enough time with his family. The culprit was technology, and his smartphone was the biggest offender. Holesh wanted to know how much time he was spending on his phone each day, so he designed an app called Moment. Moment tracked Holesh’s daily screen time, tallying how long he used his phone each day. “The app stops tracking when you're just listening to music or making phone calls,” Holesh told me. “It starts up again when you're looking at your screen- sending emails or browsing the web, for example.” Holesh was spending an hour and fifteen minutes a day glued to his screen, which seemed like a lot. So Holesh shared the app. “I asked people to guess what their daily usage was and they were almost always 50 percent too low.”

I downloaded Moment several months ago. I guessed I was using my phone for an hour a day at the most, and picking it up perhaps 10 times a day. I wasn't proud of those numbers, but they sounded about right. After a month, Moment reported that I was using my phone for an average of three hours a day, and picking it up an average of forty times. I was stunned. I wasn't playing games or surfing the web for hours, but somehow I managed to spend twenty hours a week staring at my phone.

I asked Holesh whether my numbers were typical. “Absolutely,” he said. “We have thousands of users, and their average usage time is just under three hours. They pick up their phones an average of thirty-nine times a day.” Holesh reminded me that these were the people who were concerned enough about their screen time to download a tracking app in the first place. There are millions of smartphone users who are oblivious or just don't care enough to track their usage- and there is a reasonable chance they're spending even more than three hours on their phones each day.

Most people spend between one and four hours on their phones each day- and many far longer. If, as guidelines suggest, we should spend less than an hour on our phones each day, 88 percent of Holesh’s users were over using. They were spending an average of a quarter of their waking lives on their phones- more time than any other daily activity, except sleeping. Each month almost one hundred hours was lost to checking email, texting, playing games, surfing the web, reading articles, checking bank balances, and so on. Over the average lifetime, that amounts to a staggering *eleven years*. On average they were also picking up their phones about three times an hour. This sort of overuse is so prevalent that researchers have coined the term “nomophobia” to describe the fear of being without mobile phone contact (an abbreviation of “no-mobile-phobia”).

Smartphones rob us of time, but even their mere presence is damaging. In 2013, two psychologists invited pairs of strangers into a small room and asked them to engage in conversation. To smooth the process, the psychologists suggested a topic: why not discuss an interesting event that happened to you over the past month? Some of the pairs talked while a smartphone sat idle nearby, while for others the phone was replaced by a paper notebook. Every pair bonded to some extent, but those who grew acquainted in the presence of the smartphone struggled to connect. They described their relationships that formed as lower in quality, and their partners as less empathic and trustworthy. Phones are disruptive by their mere existence, even when they aren't in active use. They’re distracting because they remind us of the world beyond the immediate conversation, and the only solution, the researchers wrote, is to remove them completely.

Smartphones aren't the only culprits. Bennett Foddy has played thousands of video games, but refuses to play World of Warcraft. Foddy is a brilliant thinker with dozens of interests. He works as a game developer and professor at New York University's Game Center. World of Warcraft may be one of the most addictive behavioral experiences on the planet. It's a massive, multiplayer online role-playing game, with millions of players from around the world who create avatars that roam around landscapes, fight monsters, complete quests, and interact with other players. Almost half of all players consider themselves “addicted.” An article in *Popular Science* described World of Warcraft as “the obvious choice” when searching for the world's most addictive game.

Intrusive tech has also made shopping, work, and porn harder to escape. It was once almost impossible to shop and work between the late evening and early morning, but now you can shop online and connect to your workplace anytime of the day. Life is more convenient than ever, but convenience has also weaponized temptation. So how did we get here?

A behavior is addictive only if the rewards it brings now are eventually outweighed by damaging consequences. Addiction is a deep attachment to an experience that is harmful and difficult to do without. Behavioral addictions don't involve eating, drinking, injecting, or smoking substances. They arise when a person can't resist a behavior, which, despite addressing a deep psychological need in the short-term, produces significant harm in the long-term.

*Obsession* and *compulsion* are close relatives of behavioral addiction. Obsessions are thoughts that a person can't stop having, and compulsions are behaviors a person can't stop enacting. There is a key difference between addictions, and obsessions and compulsions. Addictions bring the promise of immediate reward, or positive reinforcement. In contrast, obsessions and compulsions are intensely unpleasant to *not* pursue. They promise relief- also known as negative reinforcement- but not the appealing rewards of a consummated addiction.

Behavioral addiction also has a third relative in obsessive passion. In 2003, seven Canadian psychologists, led by the researcher Robert Vallerand, wrote a paper splitting the concept of passion in two. “Passion,” they said, “is defined as a strong inclination toward an activity that people like, that they find important, and in which they invest time and energy.” Harmonious passions are very healthy activities that people choose to do without strings attached- the model train set that an elderly man has been working on since his youth, or the series of abstract paintings that a middle-aged woman creates in her free time. “Individuals are not compelled to do the activity,” the researchers said, “but rather they freely choose to do so. With this type of passion, the activity occupies a significant but not overwhelming space in the person's identity and is in harmony with other aspects of the person’s life.”

Obsessive passions, however, are unhealthy and sometimes dangerous. Driven by a need that goes beyond simple enjoyment, they’re likely to produce behavioral addictions. As the researchers defined it, the individual “cannot help but to engage in the passionate activity. The passion must run its course as it controls the person. Because activity engagement is out of the person’s control, it eventually takes disproportionate space in the person's identity and causes conflict with other activities in the person's life.” This is the video game that a teenager plays all night instead of sleeping and doing his homework. Or the runner who once ran for fun, but now feels compelled to run at least six miles a day at a certain pace, even as debilitating stress injuries set in. Until she's on her back, unable to walk, she'll continue to run daily because her identity and well-being are intimately bound with her as yet unbroken streak. Harmonious passions “make life worth living,” but an obsessive passion plagues the mind.

Smartphones and email are hard to resist- because they are both part of the fabric of society and promote psychologically compelling experiences- and there will be other addictive experiences in the coming decades. We shouldn't use a watered-down term to describe them and we should acknowledge how serious they are, how much harm they’re doing to our collective well-being, and how much attention they deserve. The evidence so far is concerning, and trends suggest we're wading deeper into dangerous waters.

Just how common are behavioral addictions? The most debilitating addictions, which hospitalize people or render them incapable of living vaguely normal lives, are quite rare, affecting just a few percent of the population. But moderate behavioral addictions are far more common. These addictions make our lives less worthwhile, make us less effective at work and play, and diminish our interactions with other people. They inflict milder psychological traumas than severe addictions, but even milder traumas accumulate over time to degrade a person's well-being.

Online interactions aren't just different from real-world interactions; they’re measurably worse. Humans learn empathy and understanding by watching how their actions affect other people. Empathy can't flourish without immediate feedback, and it's a very slow-developing skill.

Many teens refuse to communicate on the phone or face-to-face, and they conduct their fights by text. “It's too awkward in person,” one girl told psychologist Catherine Steiner-Adair. “I was just in a fight with someone and I was texting them, and I asked, ‘Can I call you, or can we video-chat?’ and they were like, ‘No.’” Another girl said, “You can think it through more and plan out what you want to say, and you don't have to deal with their face or see their reaction.” That's obviously a terrible way to learn to communicate, because it discourages directness. As Steiner-Adair said, “Texting is the worst possible training ground for anyone aspiring to a mature, loving, sensitive relationship.” Meanwhile, teens are locked into this medium. They either latch onto the online world, or they choose not to “spend time” with their friends.

Like Steiner-Adair, journalist Nancy Jo Sales interviewed girls aged between thirteen and nineteen to understand how they interacted with social media. For two and a half years she traveled around the United States, visiting ten states and speaking to hundreds of girls. She, too, concluded that they were enmeshed in the online world, where they learned and encountered cruelty, oversexualization, and social turmoil. Sometimes social media was just another way to communicate- but for many of the girls, it was a direct route to heartache. As addictive contexts go, this was a perfect storm: almost every teenage girl was using one or more social media platforms, so they were forced to choose between social isolation and compulsive overuse. No wonder so many of them spend hours texting and uploading Instagram posts every day after school; by all accounts, that was the rational thing to do.

**Chapter 2: The Addict in All of Us**

Great scientists make their discoveries using two distinct approaches: tinkering and revolutionizing. If the engineer Peter Milner was a tinkerer, the psychologist James Olds was a revolutionary. Together they made a superb team. In the early 1950s, in a small basement lab filled with caged rats and electrical equipment at Montreal's McGill University, Olds and Milner ran one of the most famous addiction experiments of all time.

For decades, experts had assumed that drug addicts- laudanum lushes, poppy tea drinkers, and opiate addicts- were predisposed to the condition, somehow wired incorrectly. Olds and Milner were some of the first researchers to turn that idea on its head- to suggest that, perhaps, under the right circumstances, we could all become addicts.

Their biggest discovery began modestly. Olds and Milner were trying to show that rats would run to the far end of their cages whenever an electrical current zapped their tiny brains. The researchers implanted a small probe, which delivered a burst of electrical current to each rat's brain when the rat pressed a metal bar. To their surprise, instead of retreating, Rat No. 34 stubbornly scampered across his cage and pressed the bar over and over again. Rather than fearing the shocks as many other rats had done earlier, this rat hunted them down. The experimenters looked on as Rat No. 34 pushed the bar more than seven thousand times in twelve hours: once every five seconds without rest. Like an ultramarathon runner who deliriously refuses to stop for sustenance, the rat ignored a small trough of water and a tray of pellets. Sadly, he had eyes only for the bar. Twelve hours after the experiment began, Rat No.34 was dead from exhaustion.

At first, Olds and Milner were confused. If every other rat avoided the shocks, why would Rat No. 34 do the opposite? Perhaps there was something wrong with his brain. Milner was ready to try the experiment with a different rat when Olds made a bold suggestion. Considering Rat No. 34’s behavior carefully, he became convinced that the rat was *enjoying* the shocks. It wasn't that he was seeking out pain, but rather that the shocks felt good. “The genius of Jim Olds was that he was open-minded enough and crazy enough to think that the animal *liked* being shocked,” Ashton Jones said. “At the time, no one imagined that electrical stimulation in the brain could be pleasurable, but Olds was crazy enough to think the animal was having a good time.”

So Olds investigated. He removed the probe from the rat’s brain and noticed that it was bent. “Olds had been aiming for the mid-brain, but the probe bent into the rats septum,” says Aston-Jones. A fraction of an inch made all the difference between delight and discomfort. Olds took to calling this area of the brain the “pleasure center,” a simplistic name that nonetheless captures the euphoria that rats- and dogs, goats, monkeys, and even people- feel when the area is stimulated. Some years later, when neuroscientist Robert Heath inserted an electrode into a depressed woman's pleasure center, she began to giggle. He asked why she was laughing, and though she couldn't offer an explanation, she told him that she felt happy for the first time in as long as she could remember. As soon as Heath removed the probe, the patient’s smiled disappeared. She was depressed again- and worse, she now knew what it felt like to be happy. She wanted more than anything for the probe to remain implanted, delivering regular shocks like a small hedonic pacemaker. Like Olds and Milner before him, Heath had shown how addictive euphoria could be.

After the demise of Rat No. 34, Olds and Milner found the same addictive behavior when they stimulated the pleasure center of other rats. Those rats, too, ignored food and water while they pushed the little bar over and over again. Aryeh Routtenberg worked on some of these follow-up experiments, and he recalls that the rats behaved like addicts. The bar-pushing rats were no different from rats that had addictive substances injected directly into their brains. “We threw all sorts of feel-good drugs at the animals-amphetamines, chlorpromazine, monoamine oxidase inhibitors- and they behaved just like the self-stimulating rats.” Routtenberg remembers an experiment that showed the power of the pleasure center:

One of the nice things about being a professor is that you can study whatever you like. I wanted to see what would happen if I made the bar-pressing animals drunk. I injected the alcoholic equivalent of a three-martini lunch into several rats, who just fell over. We lifted them up- as you’d drag a drunkard from the bar- and we led them over the small metal bar. We laid them down so their heads brushed against the bar, which delivered a shock to their brains. In no time, these rats started pressing the bar over and over again. They were catatonic just a minute ago, but now they looked absolutely normal! After ten or fifteen minutes, we disabled the shocks, and the rats fell back into a stupor.

That wasn't the only reason why the researchers saw the rats as tiny addicts. They showed the same restlessness between hits. They showed the same restlessness that human drug addicts show between hits. When researchers prevented the rats from shocking themselves more than once every few minutes, the rats took to drinking lots of water to pass the time. “The minute the reward stopped, they'd start drinking like crazy,” recalls Routtenberg. “I’d come back between experimental sessions and they were sitting there, completely bloated! It's like they were doing something- anything- to pass the time. Their reward was so great that they would need to find a way to pass the time until the next reward was available.”

Olds and Milner originally believed that Rat No. 34 was predisposed to be an addict. They assumed that a problem with his internal wiring had driven him to place electric stimulation above all else- even food, water, and ultimately life. But at Olds’ urging, they realized that there was nothing wrong with Rat No. 34. He wasn't an addict by nature. He was just an unfortunate rat that happened to be in the wrong place at the wrong time.

This is one of the great lessons from Olds and Milner's experiment. Rat No. 34 behaved like an incurable addict but that didn't mean there was something wrong with his brain. He was simply responding as any rat would have done when a probe delivered shocks to his pleasure center.

**The Biology of Behavioral Addiction**

There’s a modern-day malady that affects two thirds of all adults. Its symptoms include: heart disease, lung disease, kidney disease, appetite suppression, poor weight control, weakened immune functioning, lowered resistance to disease, higher pain sensitivity, slowed reaction times, mood fluctuations, depressed brain functioning, depression, obesity, diabetes, and certain forms of cancer. That malady is chronic sleep deprivation, which is rising in the wake of smartphones, e-readers, and other light-emitting devices. Sleep deprivation is behavioral addiction’s partner- the consequence of persistent overengagement.

Ninety-five percent of adults use an electronic device that emits light in the hour before bed, and more than half check their emails overnight. Sixty percent of adults aged between eighteen and sixty-four keep their phones next to them when they sleep, which might explain why 50 percent of adults claim they don't sleep well because they’re always connected to technology. Sleep quality has declined dramatically in the past half century, particularly over the past two decades, and one of the major culprits is the bluish light that emanates from many of these electronic devices.

For millennia, blue light existed only during the daytime. Candles and wood fires produced reddish-yellow light, and there was no artificial lighting at night. Firelight isn't a problem, because the brain interprets red light as a signal for bedtime. Blue light is a different story, because it signals morning. So 95 percent of us are inducing jet lag at night by telling our bodies that the day is beginning just before we go to bed.

As much as blue light hampers our ability to sleep, the real damage of behavioral addiction happens when we're wide awake, obsessively juggling laptops and tablets, fitness trackers and smartphones.

The human brain exhibits different patterns of activity for different experiences. A clump of neurons fires when you imagine your mother's face; a different clump when you imagine the house where you grew up. These patterns are fuzzy, but by looking at a person's brain you can tell roughly whether she's thinking about her mother or her first home.

There's also a pattern that describes the brain of a drug addict as he injects heroin, and a second that describes the brain of a gaming addict as he fires up a new World of Warcraft quest. They turn out to be almost identical. Heroin acts more directly, generating a stronger response than gaming, but the patterns of neurons firing across the brain are almost identical. “Drugs and addictive behaviors activate the same reward center in the brain,” according to Claire Gillan, a neuroscientist who studies obsessive and repetitive behaviors. “As long as a behavior is rewarding- if it's been paired with rewarding outcomes in the past- the brain will treat it the same way it treats a drug.” What makes drugs like heroin and cocaine more dangerous is the short-term is that they stimulate the reward center much more strongly than behaviors do. “Cocaine has more direct effects on the neurotransmitters in your brain than, for example, gambling, but they work by the same mechanism on the same systems. The difference is in their magnitude and intensity.”

This idea is quite new. For decades, neuroscientists believed that only drugs and alcohol could stimulate addiction, while people responded differently to behaviors. Behaviors might be pleasurable, they suggested, but the pleasure could never rise to the destructive urgency associated with drug and alcohol abuse. But more recent research has shown that addictive behaviors produced the same brain responses that follow drug abuse. In both cases, several regions deep inside the brain release a chemical called dopamine, which attaches itself to receptors throughout the brain that in turn produce an intense flush of pleasure. Most of the time the brain releases only a small dose of dopamine, but certain substances and addictive experiences send dopamine production into overdrive. Warming your hands by a log fire on a cold night or taking a sip of water when you're thirsty feels good, but that sensation is dramatically more intense for an addict when he injects heroin or, to a lesser extent, begins a new World of Warcraft quest.

At first the upsides dramatically outweigh the downsides as the brain translates the rush of dopamine into pleasure. But soon the brain interprets this flooding as an error, producing less and less dopamine. The only way to match the original high is to up the dosage of the drug or the experience- to gamble with more money or snort more cocaine or spend more time playing a more involving video game. As the brain develops a tolerance, it's dopamine-producing regions go into retreat, and the lows between each high dip lower. Instead of producing the healthy measure of dopamine that once inspired optimism and contentment in response to small pleasures, these regions lie dormant until they’re over stimulated again. Addictions are so pleasurable that the brain does two things: first it produces less dopamine to dam the flood of euphoria, and then, when the source of that euphoria vanishes, it struggles to cope with the fact it's now producing far less dopamine than it used to. And so the cycle continues as the addict seeks out the source of his addiction, and the brain responds by producing less and less dopamine after each hit.

Maia Szalavitz, a writer who focuses on addiction, says, “In order to develop an addiction, you have to repeatedly take the drug for emotional relief to the point where it feels as though you can't live without it… it can only happen when you start taking doses early or take extra when you feel a need to deal with issues other than pain. Until your brain learns that the drug is critical to your emotional stability, addiction cannot be established.” Addiction isn't just a physical response; it's how you respond to that physical experience psychologically.

“Addiction isn't about ‘breaking’ your brain, or ‘hijacking’ your brain, or ‘damaging’ your brain,” Szalavitz says. “People can be addicted to behaviors, and even to the experience of love. Addiction is really about the relationship between the person and the experience.” It isn't enough to ply someone with a drug or a behavior- that person also has to learn that the experience is a viable treatment for whatever ails them psychologically.

The highest risk period for addiction is early adulthood. Very few people develop addictions later in life if they haven't been addicted in adolescence. One of the major reasons is that young adults are bombarded by a galaxy of responsibilities that they're not equipped to handle. They learn to medicate by taking up substances or behaviors that dull the insistent sting of those persistent hardships. By their midtwenties, many people acquire the coping skills and social networks that they lack in adolescence. “If you aren't using drugs as a teenager, you're probably also learning to deal with your troubles using other methods,” Szalavitz said. So you develop a degree of resilience by the time you emerge through the gauntlet of adolescence.

Addiction is the association between an unfulfilled psychological need and a set of actions that assuaged the need in the short-term, but was ultimately harmful in the long-term. Any experience can be addictive if it seems to soothe the psychological distress. Though the American Psychiatric Association (APA) still considers addiction a disease, the APA has acknowledged that addiction isn't limited to substance abuse.

Every fifteen years or so the APA releases a new edition of its bible, the *Diagnostic and Statistical Manual of Mental Disorders* (DSM). The DSM catalogs the signs and symptoms of dozens of psychiatric disorders, from depression and anxiety to schizophrenia and panic attacks. When the APA released the 5th edition of the DSM in 2013, it added *behavioral addiction* to its list of official diagnoses, and abandoned the phrase *substance abuse and dependence* in favor of *addictions and related disorders*. Psychiatrist had been treating behavioral addicts for years, and now the APA was catching up.

The APA is now only endorsing the link between substance addiction and behavioral addiction, but isolated researchers have been making similar claims for decades.

In the 1990s, a neuroscientist at the University of Michigan named Kent Berridge was trying to understand why addicts continued using drugs as their lives deteriorated. Berridge and his colleagues had shown that there was a big difference between liking a drug and wanting a drug. Addiction was more than just liking. Addicts weren't people who happened to like the drugs they were taking- they were people who *wanted* those drugs very badly even as they grew to dislike them for destroying their lives. What makes addiction so difficult to treat is that wanting is much harder to defeat than liking. “When people make decisions, they privilege wanting over liking,” Berridge said. “Wanting is much more robust and big and broad and powerful. Liking is anatomically tiny and fragile- it's easily disrupted and it occupies only a very small part of the brain. In contrast, it's not easy to disrupt the activation of an intense want. Once people want a drug, it's nearly permanent- it lasts at least a year in most people, and may last almost a whole lifetime.” Berridge’s ideas explain why relapse is so common. Even after you come to hate a drug for ruining your life, your brain continues to want the drug. It remembers that the drug soothed a psychological need in the past, and so the craving remains. The same is true of behaviors: even as you come to loathe Facebook or Instagram for consuming too much of your time, you continue to want updates as much as you did when they still made you happy. One recent study suggests that playing hard to get has the same effect: an unattainable romantic partner is less likable but more desirable, which explains why some people find emotionally unavailable partners alluring.

The depths of addiction are no fun at all, which is another way of saying that addicts crave a hit without *liking* the experience. Stanton Peele likened addiction to misguided love, and falling in love with the wrong person is a classic case of wanting without liking. Loving the wrong person is so common that we have stereotypes for the “guy who's no good” and the “female fatale.” We know they're no good for us, but we can't help wanting them.

**PART 2: The Ingredients of Behavioral Addiction (or, How to Engineer an Addictive Experience)**

**Chapter 4: Goals**

Goals have been around for as long as our planet has sustained life. What has changed, though, is how much our lives are occupied by gold pursuit. Once Upon a time goals were mostly about survival. We foraged for food and preened for attractive mates, and these activities were critical to the survival of our species. Goals were a biological imperative rather than a luxury or a choice. Our species would never have survived had our ancestors spent their time pursuing goals for no good reason. When food and energy were scarce, the guy who climbed the nearest mountain just for fun, or ran 100 miles just to see if he could, didn't last very long at all. Today, for much of the world, food and energy are abundant, and you can live a long and happy life while choosing to take on unnecessary hardships like mountaineering an ultramarathon running. And once you've finished climbing one mountain or running one race, you can start preparing for the next one, because today goals are far more than just destinations; today we’re fixed on the journey, and often the act of reaching the goal is an incidental anticlimax.

There's plenty of evidence for this rise in goal culture if you know where to look. You can see it in the rise of the phrase “gold pursuit,” which was absent from English language books until 1950: the concept of setting one goal after another- of perfectionism- is also quite new. The word barely existed in the early 1800s, but it seems to be everywhere now. In 1900 the word appeared in just 0.1 percent of every book (you’d need to read more than one thousand books to see it written just once). Today roughly 5 percent of all books (or one in twenty) mention the idea of “perfectionism.”

This could be just a matter of language shifts; maybe people had other words for “perfectionism” and “goal pursuit” in the 1800s, and those words have now been replaced. If that were true, you’d expect those phrases to have become less common over time, but none of the dictionary synonyms for “perfectionism” and “gold pursuit” have died out. If anything, most of them have become more common- terms like “quest,” “plan,” “target,” “objective,” and “striving.”

Even beyond the world of books, goals have become harder to escape. The Internet has exposed people to goals they barely knew existed, and wearable tech devices have made goal tracking effortless and automatic. Where once you had to seek out new goals, today they land, often uninvited, in your inbox and on your screen. But it might get by if we were able to leave those emails unread for hours or even days at a time, but to the detriment of productivity and well-being, we can't help responding to new emails almost as soon as they arrive.

How long do you think the average office email goes unread? I guessed 10 minutes. The truth is just six seconds. In reality, 70 percent of office emails are read within six seconds of arriving. Six seconds is less time than it's taking you to read this paragraph so far, but it's long enough for the average worker to disrupt whatever he's doing to open his email program and click on the incoming email. This is hugely disruptive: by one estimate, it takes up to twenty-five minutes to become re-immersed in an interrupted task. If you open just twenty-five emails a day, evenly spaced across the day, you'll spend literally no time in the zone of maximum productivity.

The solution is to disable new email notifications and to check your email account infrequently, but most people don't treat email that way. Many of us pursue the unforgiving goal of *Inbox Zero*, which requires you to process and file away every single unread email as soon as it arrives. And, has Chuck Klosterman wrote in the *New York Times*, emails are like zombies: you keep killing them and they keep coming. Inbox Zeroalso explains why workers spend a quarter of their day dealing with emails, and why they check their accounts, on average, thirty-six times every hour.

Katherine Schreiber and Leslie Sim are experts on exercise addiction who believe that tech advances encourage obsessive goal monitoring. Schreiber and Sim loathe wearable tech. “It's the worst” Schreiber says. “The dumbest thing in the world,” says Sim. Schreiber has written extensively about exercise addiction, and Sim as a clinical child adolescent psychologist at the Mayo Clinic. Many of Sim’s adolescent patients have twin exercise and eating disorders, which tend to go together.

Numbers pave the road to obsession. “When it comes to exercise, everything can be measured,” Sim says. “How many calories you burn; how many laps you run; how fast you go; how many reps you do; how many paces you take. And if you went, say, two miles yesterday, you don't want to go less than that today. It becomes fairly compulsive.”

“Counting steps and calories doesn't actually help us lose weight; it just makes us more compulsive. We become less intuitive about our physical activity and eating.” Even if you're tired, and feel you need to rest, you’ll continue walking or running till you reach your arbitrary numerical goal. Schreiber agreed. To her, the pangs she feels when she's not working out are a lot like love. “When you're not with your significant other, or whoever you're in love with, you long to be with that person.” The moral is that it's healthy to make goals more difficult to measure, but also that it is dangerous to have devices that monitor everything from our heart rates to the number of steps we've walked today.

In 2000, Marylanders Dawn and John Strumsky founded the United States Running Streak Association (USRSA). The association celebrates runners who haven't missed a day of running for many years. (“Running” consists of traveling one mile or more without the aid of crutches or a stick.) The association releases a quarterly bulletin that celebrates milestones. Run for thirty-five years straight and you become a Grand Master; forty years and you become a Legend. If you reach forty-five years, you're called a Covert, after Mark Covert, who retired when he became the first person to reach the forty-five year mark, in 2013. As you can imagine, many of the association's runners have persevered through near-impossible conditions.

There's also something insidious about streaks. Because they demand repeated activity without a break, they become more precious over time. A two-week run isn’t much to protect, but even laid-back runners slavishly protect streaks that reach beyond the one-year mark, running on a hobbled ankle or through a bout of the flu. Robert Kraft, a sixty-four-year-old runner from Miami, recently hit the forty-year mark. Kraft pushes through arthritis, a painful condition that affects his spine, and a degenerated disc. Each run is painful for Kraft, but he wouldn't dream of missing a day. This is dangerous and even the Running Streak Association website now publishes a warning, written by founder John Strumsky, imploring streakers to “rest and recuperate to avoid injuries.” To most runners, this means a day of rest, but to streakers, it's a day of easy running. For many people, the heaviest cost of sustaining a streak is psychological. After compiling a streak of one hundred and thirty-one days, Michelle Fritz Realized this streak was “becoming an idol.” She had no time for her husband and children, and decided to skip a day.

Streaks uncover the major flaw with gold pursuit: you spend far more time pursuing the goal than you do enjoying the fruits of your success. Even if you succeed, success is brief. Writing for the *Guardian,* human behavior expert Oliver Burkeman explained:

When you approach life as a sequence of milestones to be achieved, you exist “in a state of near-continuous failure.” Almost all the time, by definition, you're not at the place you've defined as embodying accomplishment or success. And should you get there, you'll find you've lost the very thing that gave you a sense of purpose- so you'll formulate a new goal and start again.

Burkeman was quoting from Scott Adams, the cartoonist and creator of the *Dilbert* comic strip, who condemned goal pursuit in his book, *How to Fail at Almost Everything and Still Win Big*. Adams promoted an alternative: instead of goals, live your life by systems. A system is “something you do on a regular basis that increases your odds of happiness in the long run.” For a cartoonist, that might be drawing one cartoon per day; for a writer, writing five hundred words per day. In contrast to goals, systems bring a steadier stream of low-grade highs. They’re guides to a fulfilling day, day by day, rather than enticing pictures of some grand end goal without instructions for how to get there.

Systems stand in stark contrast to goals “attract one thousand Instagram followers,” which serve only as signposts of failure. When you do reach your goal, a new one materializes in its place- now two thousand Instagram followers seem like an appropriate target. The defining goal of our time, perhaps, is to amass a certain sum of money. That some begins small but grows overtime. In 2014, a former Wall Street trader named Sam Polk published an op-end in the *New York Times* titled “For the Love of Money.” Polk explained that his goal was modest, at first, and then escalated repeatedly. “I'd gone from thrilled at my first bonus- $40,000- to being disappointed when, my second year at the hedge fund, I was paid ‘only’ $1.5 million.” Some of Polk’s bosses were billionaires, so he, too, wanted a billion dollars. “On a trading desk, everyone sits together, from interns to managing directors,” Polk said. “When the guy next to you makes 10 million, 1 million or 2 million doesn't look so sweet.”

Polk was describing the principle of social comparison. We constantly compare what we have to what other people have, and the conclusions we draw depend on who those people are. A bonus of $40,000 looks terrific when you remember that some of your friends are in $40,000 a year; but if your friends are high flying traders who are in $40,000 a week, you'll be disappointed. Humans are inherently aspirational; we look ahead rather than backward, so no matter where we stand, we’ll tend to focus on people who have more. That experience produces a feeling of loss, or deprivation, relative to those other people. That's why Polk was never happy; no matter how much he earned, there was always someone who earned more. As ridiculous as it may sound, even billionaires are poor next to multibillionaires, so they, too, feel the sting of relative deprivation.

Polk was convinced that this perpetual goal, even among the very wealthy, reflected a “lack of connection with your life's work.” You don't need to keep score with money if you're truly, deeply motivated by what you're doing. Goals function as placeholders that propel you forward when the daily systems that run your life are no longer fulfilling. Echoing Adams and Burkeman, Polk told me that the key is to find something that brings you small doses of positive feedback.

In moderation, personal goal-setting makes intuitive sense, because it tells you how to spend your limited time and energy. But today, goals visit themselves upon us, uninvited. Sign up for a social media account, and soon you’ll seek followers and likes. Create an email account, and you'll forever chase an empty inbox. Wear a fitness watch, and you'll need to walk a certain number of steps each day. Play Candy Crush and you'll need to break your existing high score. If your pursuit happens to be governed by time or numbers- running a marathon, say, or measuring your salary- goals will come in the form of round numbers and social comparisons. You may find you want to run faster and earn more than other people, and to beat certain natural milestones. Running a marathon in 4:01 will seem like a failure, as will earning $99,500. These goals pile up, and they fuel addictive pursuits that bring failure or, perhaps worse, repeated success that spawns one new ambitious goal after another.

**Chapter 5:Feedback**

It's hard to exaggerate how much the “like” button changed the psychology of Facebook use. Users are gambling every time they share a photo, web link, or status update. A post with zero likes isn't just privately painful, but is also a kind of public condemnation: either you didn't have enough online friends, or, worse still, your online friends weren't impressed. Facebook was the first major social networking force to introduce the like button, but others now have similar functions. You can like and repost tweets on Twitter, pictures on Instagram, post on Google+, columns on LinkedIn, and videos on YouTube.

The act of liking subsequently became the subject of etiquette debates. What did it mean to refrain from liking a friends post? If you liked every third post, was that an implicit condemnation of the other posts? Liking became a form of basic social support- the online equivalent of laughing at a friend’s joke in public.

**Chapter 6: Progress**

Shigeru Miyamoto knows how to design a video game that people can't stop playing. He is the gaming world's answer to Steven Spielberg or Stephen King or Steve Jobs- an artist who understands what people want better than they do, and who turns everything he touches to gold. Miyamoto was behind the second-highest grossing game of all time. What Miyamoto seemed to recognize better than anyone was that addictive games offered something to both novices and experts. Games designed only for beginners would grow stale too soon, and games designed only for experts would lose newcomers before they became masters.

When Miyamoto was twenty-four when he joined Nintendo. The early 1980s were difficult for Nintendo. Nintendo's head engineer approached young Miyamoto and asked him to design a new game that would save the dying company. Miyamoto’s first game was a classic named Donkey Kong. The young hero of the game was a mustachioed plumber named Mario, who was named for Nintendo America's warehouse landlord, Mario Segale. The same Mario would go on to feature in one of the best-selling series of all time, Super Mario Bros. Super Mario was where Miyamoto showcased his ability to make games attractive to players at all levels.

Historically most gamers have been men, but the gaming world has begun to appeal to women and other underserved groups. In fact, in August 2014, women over the age of eighteen became the largest demographic in gaming. They represent 36 percent of gamers, whereas men over the age of eighteen make up 35 percent of all gamers. This rise was fueled, in part, by games like Kim Kardashian’s Hollywood. Kardashian released the game in June 2014, and in its first year it took in tens of millions of dollars. Almost half of the game's revenue went to Kardashian herself.

Like World of Warcraft, Kardashian’s game delivers small doses of positive feedback to entice players as soon as they begin. The game's production company, Glu Games, does plenty of testing to make sure those rewards are delivered at precisely the right intervals. One *Business Insider* columnist declared the game “uniquely toxic and addictive… perhaps the only app that really deserves the comparison to drugs.” Other journalists reported similar addictions. *Jezebel’s* Tracie Morrissey admitted spending nearly five hundred dollars on the game: “You guys, I literally think I have a problem. What a lame, embarrassing addiction to have. What would I even say if I tried to get help for this at AA or something?” Emile Linder wrote an article on MTV.com titled “True Life: I Got Addicted to the Kim Kardashian Game,” and admitted using most of her family's data plan when she played, sometimes through the night. Many of these “addicts” are high-functioning people who otherwise hold down impressive jobs and raise families. They aren't the stereotypical addicts of yesteryear, which is precisely what makes the products that seize them so insidious. One minute, they’re novices passing time with a new, free game, and the next they're apologizing for blowing the family budget on gameplay.

For decades, video games were played by teenage boys and men who never grew up. That's no longer true, because gamers don't need consoles or big chunks of free time. Smartphones have changed the gaming landscape completely. Take FarmVille, the game that World of Warcraft embedded in its platform. “FarmVille was wildly popular,” says Frank Lantz, director of the New York University's Game Center. Roughly one in ten Americans have played FarmVille, and for two years it was the most popular game on Facebook. Players were charged with building a farm by tending to virtual crops and animals. The game was addictive and predatory: once players built their farms, they had to return to the game and preset intervals to water their crops. If the crops died, which happened to millions of players whose lives and sleep schedules sometimes prevented them from returning to the game, they could pay to “unwither” those crops. People spent untold sums of money undoing that neglect. *Time* called the game one of the fifty worst inventions of all time because its “series of mindless chores” was so addictive.

Experts have believed that games were fundamentally more attractive to males than females, but that difference turns out to have been cultural. Now that smartphones have become game delivery devices, many of the most popular games, such as FarmVille, Kim Kardashians Hollywood, and Candy Crush, are played by more women than men. All you need is the right environment- and then removal of barriers that prevent novices from taking their first hit- and you'll find a brand-new segment of addicts that looks nothing like the addicts who came before them.

Kimberly Young, a psychologist who practices at a small regional hospital in Bradford, Pennsylvania, coined the phrase “Internet addiction” in 1995, and in 2010 she opened the Center for Internet Addiction- the country's first hospital-based treatment center for Internet addiction. Most Internet addicts are hooked on games. “In the mid 2000s, as the infrastructure of the Internet improved, Internet addiction became a much bigger problem,” Young said. “But the biggest changes, by far, were the introduction of the iPhone and the iPad in 2010.” Games became mobile, available to anyone with a smartphone all the time. Instead of a string of teenage boys, Young was suddenly treating both males and females of all ages and personality types. What had saved these people from forming Internet addictions beforehand was that gaming was largely inaccessible. You had to decide to buy a console, and you had to have hours and hours of free time on your hands. Apart from teenage boys, most people were excluded on one or more fronts. “Everybody now has a tablet or an iPhone or a smart device, and it cuts across generations,” Young told me.

**Chapter 7: Escalation**

To some extent we all need losses and difficulties and challenges, because without them the thrill of success weakens gradually with each new victory. That's why people spend precious chunks of free time doing difficult crosswords and climbing dangerous mountains- because the hardship of the challenge is far more compelling than knowing you're going to succeed. This sense of hardship is an ingredient in many addictive experiences, including one of the most addictive simple games of all time: Tetris. *The Tetris effect*, which affects people who have played any animated game for long periods of time. Nintendo was smart to include the game with their new portable console, because it was easy to learn and very difficult to abandon.

Near wins signal that success is nearby. That's why many people continue to play Super Hexagon in the face of countless failures. In the context of a game of skill this makes perfect sense- a near win sends the useful signal that you're close to achieving victory. With practice and grit you're likely to achieve that goal. But sometimes that signal is meaningless, particularly when the game relies entirely on luck. As anthropologist Natasha Dow Schull told me, that's how casinos hook gamblers. Slot machine wins seemed to be tantalizingly close, when in fact there's no material difference between a near win and a clear loss. Neither one signals that you're more or less likely to win the jackpot in the future, since it's illegal to change the odds of winning on any particular spin.

One of the biggest problems with slot machines is that they lure you in. You can't pass a well-designed slot machine without at least slowing for a quick look. The biggest problem, though, is that they refuse to let you stop playing once you begin. What they do best is to obliterate your stopping rules. Stopping rules play a huge and sometimes overlooked role in driving addictive and compulsive behaviors.

Unfortunately, the same new technologies that make life easier also disrupt our stopping rules. Wearable tech like the Apple Watch and Fitbit allow you to track your workouts, but they also discourage you from paying attention to your body's internal exhaustion cues. Both Katherine Schreiber and Leslie Sim, the exercise addiction experts mentioned earlier, think that wearing tech aggravates the problem. “Tech plays a role inasmuch as it reinforces the calculating mind-set,” Schreiber told me. It reinforces how much attention you pay to walking a certain number of steps or getting a certain number of hours of R.E.M. sleep, for example. I've never used one of these devices because I know they would drive me insane. It's a trigger for all sorts of addictive behaviors.” Sim compared Fitbit's to calorie counting, which “doesn't help us manage our weight any better; it just makes us more obsessive.” Calorie counting makes us less intuitive about what we're eating, and Sim also wondered whether wearable tech made us less intuitive about physical activity. Some of her patients say things like, “If I've only done fourteen thousand steps today, even though I'm really tired and I need to rest, I have to go out and do my extra two thousand steps.” These results are also concerning, because the healthiest approach to exercising in moderation and eating well is to enjoy them- to cultivate an intrinsic preference for salads and thirty minutes of walking over burgers and inactivity. Unfortunately, counting calories and steps crowds out intrinsic motivation by signaling that you're only being healthy because you're trying to meet numerical targets.

The same technology that drives people to overexercise also binds them to the workplace twenty-four hours a day. Until recently, people left work behind when they left the office, but now, with the introduction of smartphones, tablets, remote log-ins, and emails that find us wherever we happen to be, that stopping rule is obsolete. Since the late 1960s, but especially in the past two decades, Japanese workers have whispered about *karoshi,* literally “death from overworking.” The term applies to workers, particularly mid- and high-level executives who struggle to leave work behind at the end of the day. As a result, they die prematurely from strokes, heart attacks, and other stress-induced ailments.

A recurring theme in karoshi cases is that victims spend far more time at work than necessary. They’re often successful, and they have more than enough money. They aren't bound to work longer hours to support themselves, but for one reason or another, they can't seem to stop.

As with Tetris, humans find the sweet spot sandwiched between “too easy” and “too difficult” irresistible. It's the land of just-challenging enough computer games, financial targets, work ambitions, social media objectives, and fitness goals. Addictive experiences live in this sweet spot, where stopping rules crumble before obsessive goal-setting. Tech mavens, game developers, and product designers tweak their wares to ensure their complexity escalates as users gain insight and competence.

**Chapter 8: Cliffhangers**

In August 2012, Netflix introduced a subtle new feature called “post-play.” With post-play, a thirteen-Episode season of *Breaking Bad* became a single, thirteen-hour film. As one episode ended, the Netflix player automatically loaded the next one, which began playing five seconds later. If the previous episode left you with a cliffhanger, all you had to do was sit still as the next episode began and the cliffhanger resolved itself. Before August 2012 you had to decide to watch the next episode; now you had to decide to *not* watch the next episode.

At first this sounds like a trivial change, but the difference turns out to be enormous. The best evidence of this difference comes from a famous study on organ donation rates. When young adults begin driving, they’re asked to decide whether to become organ donors. Psychologists Eric Johnson and Dan Goldstein noticed that organ donation rates in Europe varied dramatically from country to country. Even countries with overlapping cultures differed. In Denmark the donation rate was 4 percent; in Sweden it was 86 percent. In Germany the rate was 12 percent; in Australia it was nearly 100 percent. In the Netherlands, 28 percent were donors, while in Belgium the rate was 98 percent. Not even a huge educational campaign in the Netherlands managed to raise the donation rate. So if culture and education weren't responsible, why were some countries more willing to donate than others?

The next answer had everything to do with a simple tweak in wording. Some countries asked drivers to opt in by checking a box:

If you are willing to donate your organs, please check this box: \_\_\_\_

Checking a box doesn't seem like a major hurdle, but even small hurdles loom large when people are trying to decide how their organs should be used when they die. That's not the sort of question we know how to answer without help, so many of us take the path of least resistance by not checking the box, and moving on with our lives. That's exactly how countries like Denmark, Germany, and the Netherlands ask the question- and they all had very low donation rates.

Countries like Sweden, Austria, and Belgium have for many years asked young drivers to opt out of donating their organs by checking a box:

If you are NOT willing to donate your organs, please check this box: \_\_\_\_

The only difference here is that people are donors by default. They have to actively check a box to remove themselves from the donor list. It's still a big decision, and people still routinely prefer not to check the box. But this explains why some countries enjoy donation rates of 99 percent, while others lagged far behind with donation rates of just 4 percent. After August 2012, Netflix viewers had to opt out of watching another episode. Many chose to do nothing and, slack-jawed, they began their eighth consecutive episode of *Breaking Bad*.

**Chapter 9: Social Interaction**

People are never really sure of their own self-worth, which can't be measured like weight, or height, or income. Some people obsess over social feedback more than others do, but we’re social beings who can't ever completely ignore what other people think of us. And more than anything, inconsistent feedback drives us nuts.

Instagram is a font of inconsistent feedback. One of your photos might attract a hundred likes and twenty positive comments, while another posted ten minutes later attracts thirty likes and no comments at all. People clearly value one photo more than the other, but what does that mean? Are you “worth” a hundred likes, thirty likes, or a different number altogether? Social psychologists have shown that we adopt positive ideas about ourselves more readily than we adopt negative ideas.

But as much as we value ourselves, we're also very sensitive to negative feedback. Psychologists call this the “bad is stronger than good” principle, and it's very consistent across different experiences. If you're like most people, your instinct is to scroll to the negative reviews on Amazon, TripAdvisor, and Yelp, because nothing cements an opinion like sharp criticism. You're also more likely to remember bad events from your past, and to ruminate over old arguments longer than you bask in recent praise. Even people who had happy childhoods, when asked to recall their lives as kids, are more likely to remember the few memories that were bad rather than the many that were good. Apps like Facetune allow tech novices to airbrush away their flaws for “perfect skin; a perfect smile,” the ability to reshape their faces and bodies, remove blemishes, and recolor gray hair. Essena O’Neill, a young Australian model, had half a million followers when she decided to reveal the truth behind her glamorous Instagram posts. O'Neill changed her account name to *Social Media Is Not Real Life*, and deleted thousands of old photos.

O’Neill was voicing publicly what thousands of Instagram users felt across the globe: that the pressure to present perfection with every shot is relentless and, for many people, unbearable. In her last post, O’Neill wrote, “I've spent the majority of my teenage life being addicted to social media, social approval, social status, and my physical appearance. Social media is contrived images and edited clips ranked against each other. It's a system based on social approval, likes, validation, in views, success in followers. It's perfectly orchestrated self-absorbed judgment.”

Social confirmation, or seeing the world as others see it, is a marker that you belong to a group of like-minded people. In evolutionary terms, group members tended to survive while loners were picked off, one by one, so discouraging that you are a lot like other people is deeply reassuring. When people are deprived of these bonds, they experience a form of pain so severe that is sometimes called “the social death penalty.” It's also very long-lasting- just remembering a time when someone excluded you is enough to rekindle the same agony, and people often list cases of social exclusion among their darker memories.

Hilarie Cash, a clinical psychologist and cofounder of reSTART, explained that “there is nothing wrong with making friends online, as long as you also make friends in the real world. If we're good friends and we're sitting together, that interaction, that energetic exchange releases a whole bouquet of neurochemicals that keeps us regulated emotionally and physiologically. And it's our birthright as social animals to have lots of this sort of safe and caring interaction that keeps us regulated. We're not meant to be isolated islands.” The addictive online friendships that attract young gamers are dangerous, not for what they provide, but for what they can't provide: a chance to learn what it means to sit, face-to-face, as you maintain a conversation with another person. The staccato taps of a keyboard- and even remote webcam interactions- obey a very different rhythm, and convey information along a much narrower bandwidth. “Even the smell of another person, the consistent eye contact that comes from being in the same room, is important,” Cash said. She also reminded me that people who communicate by webcam never seem to look one another in the eyes, because the other person's eyes aren't perfectly aligned with the webcam that conveys your gaze. “It's a lot like feeding sugar to a hungry person,” Cash told me. “It's pleasurable in the short-term, but eventually, they'll starve.”

Cash invited me to participate in a group discussion session with the center's inpatients. As the session began, she repeated a mantra that I had heard a couple of times already: “Remember: once your cucumber brain has become pickled, it can never go back to being a cucumber.” The phrase was designed to discourage in patients from doing what Vaisberg had done when he left the center: believing that they could play just one more game without their addictions returning. Cash was trying to explain that the inpatients brains were forever pickled, in a sense, and that their addictions were always on the cusp of being rekindled. The mantra was a cute way of saying something very confronting: that it's impossible to ever completely escape that after effects of addiction. Cash also used the mantra to explain what happens when your brain is deprived of offline social interactions. As she told me, “If you only ever spend time online, a part of you withers away.”

Cash suggested I speak to Andy Doan, a neuroscientist who had studied learning and memory at Johns Hopkins. She told me Doan was an expert on gaming addiction who could tell me more about the downsides of interacting with people online. I called Doan as soon as I returned to New York. He works as an eye surgeon now, but he has studied and written about addiction extensively. He told me that addictive games have three critical elements: “The first part is immersion- the sense that you're embedded in the game. The second is achievement- the sense that you're achieving something. And the third- and by far the most important- is the social element.” Gaming addiction has risen dramatically, Doan said, because high speed Internet connections have made it easier to communicate with other players in real time.

One study found that gamers aged between ten and fifteen years who played more than three hours per day were less satisfied with their lives, less likely to feel empathy toward other people, and less likely to know how to deal with their emotions appropriately. Three hours may sound like a lot, but recent surveys have shown that kids spend an average of five to seven hours in front of screens each day. When today's millennials become adults, there's a fair chance that there are social cucumber brains will be pickled.

**PART 3: The Future of Behavioral Addiction (and Some Solutions)**

**Chapter 10: Nipping Addictions at Birth**

Today, the average schoolchild aged between eight and eighteen years spends a third of her life sleeping, a third in school, and a third engrossed in new media, from smartphones and tablets on TV's and laptops. She spends more time communicating through screens than she does with other people directly, face-to-face. Since the turn of the new millennium, the rate of non-screen playtime fell 20 percent, while the rate of screen playtime increased by a similar amount.

Children are especially vulnerable to addiction, because they lack the self-control that prevents many adults from developing addictive habits. Regulated societies respond by refusing to sell alcohol and cigarettes to children-but very few societies regulate behavioral addictions. Kids can still play with interactive tech for hours at a time, and they can still play video games as long as their parents will allow.

Why shouldn't kids be allowed to play with interactive tech for hours at a time? And why, as I mentioned in the books prologue, do so many tech experts prohibit their children from using the very devices they design and promote in public?

A couple of years ago, I became interested in what we call *hardship inoculation*. This is the idea that struggling with a mental puzzle- trying to remember a phone number or deciding what to do on a long Sunday afternoon- inoculates you against future mental hardships just as vaccinations inoculate you against illness. Reading a book, for example, is harder than watching the TV. (David Denby, A film critic at The *New Yorker*, wrote that kids are abandoning books as they age. Books smell like old people,” he overheard one teenager say.) There is good early evidence to support the idea that small doses of mental hardship are good for us. Young adults do much better on tricky mental puzzles when they've solved difficult (rather than easy) ones earlier. Adolescent athletes also thrive on challenge: we've found, for example, that college basketball teams do better when their season schedules are more demanding. These mild initial struggles are critical. Depriving our kids of them by handing them a device that makes everything easier is dangerous- we just don't know how dangerous.

The M.I.T. psychologist Sherry Turkle has also argued that technology turns children into poor communicators. Take the case of texting, which many children (and adults) prefer to phone calls. Texting allows you to modulate your message more precisely than does speech. If you usually reply “haha” to a joke, you can write “hahaha” to signal that this one is particularly funny- or “HAHAHAHA” signals the joke is uproarious. If you're angry, you can reply with a dismissive “k,” and if you're furious you can choose not to respond at all. To shout, use a single “!,” and to exclaim loudly, use “!!” or even “!!!!” The significant downside is that nothing is spontaneous and very little is ambiguous when you follow the rules of text-speak. There are no nonverbal cues; no pauses and lilts and unplanned giggles or scoffs to punctuate your partner's message. Without these cues, children can't learn to communicate face-to-face.

Turkle illustrates the limitations of cell phone communication by recounting an observation that comedian Louis C.K. shared with Conan O’Brien in 2013. He explained that he was not raising children; he was raising the grown-ups they're going to be. Phones, he said, are “toxic, especially for kids.”

They don't look at people when they talk to them. And they don't build the empathy. You know, kids are mean. And it's because they're trying it out. They look at a kid and they go, “You're fat.” And they see the kids face scrunch up and they go, “Ooh, that doesn't feel good to make a person do that”… but when they write, “You're fat,” then they go, “Mmm, that was fun. I like that.”

For Louis C.K., face-to-face communication is essential, because it's the only way for kids to appreciate how their words affect other people.

iPads make the job of parenting much easier. They provide renewable entertainment to kids who like watching videos or playing games, so they are a miracle for overworked and under rested parents. But they also set dangerous precedents that are difficult for kids to shake as they mature. reSTART’s Hilarie Cash has firm views on the subject. She suggests limiting screen time for two hours per day, even for teenagers. “It's not easy,” she admits. “But it's critical. Kids need sleep and physical activity, and family time, and time to use their imaginations.” Those things can't happen when they're lost in screen worlds.

The Diagnostic and Statistical Manual now recognizes that gambling is a genuine behavioral addiction, and excessive Internet use was almost included in the DSM’s fifth addition, published in 2013. There are now more than two hundred academic papers on the topic of “Internet addiction,” so the American Psychiatric Association chose to mention it briefly in the manual’s appendix. Meanwhile, the DSM omitted other behavioral addictions, like exercise, smartphone, and work addiction, because they hadn't yet attracted enough academic interest.

The answer is not to medicalize these moderate forms of addiction, but to alter the structure of how we live, both at a societal level and more narrowly, as we construct our day-to-day lives. It's far easier to prevent people from developing addictions in the first place than it is to correct existing bad habits, so these changes should begin not with adults, but with young kids. Parents have always taught their children how to eat, when to sleep, and how to interact with other people, but parenting today is incomplete without lessons on how to interact with technology, and for how long each day.

Like Alcoholics Anonymous, many clinical programs promote abstinence: either you abstain from the addictive behavior, or you'll never shake the addiction. Since abstinence isn't a practical option for many modern behaviors, one alternative intervention takes a different approach. Where Alcoholics Anonymous suggests that addicts are helpless to overcome their addictions, *motivational interviewing* rests on the idea that people are more likely to stick to their goals if they're both intrinsically motivated and feel empowered to succeed. Counselors begin by asking open-ended questions that encourage their clients to consider whether they want to change their addictive behaviors. What makes the approach radical is that clients are allowed to decide they don't want to change their behavior at all.

Carrie Wilkens, cofounder and clinical director of the Center for Motivation and Change in New York City, explained the process. “The key to motivational interviewing is getting the costs and also the benefits of the addictive behavior on the table. We all know how terrible addiction is, but it also has benefits, and this tends to be the most meaningful part of the puzzle. Unpacking the behavior’s benefits is great because you can understand the underlying needs that the behavior addresses.”

The approach also recognizes that different people are driven to overcome their addictions by different motives. For some people, addictions are a barrier to productivity; for others, a barrier to health; and for many, a barrier to fulfilling social relationships. Motivational interviewing uncovers that motive, and prompts the addicted person to change.

The technique's effectiveness is explained by one of the dominant theories in motivation research: Self-Determination Theory (SDT). SDTexplains that people are naturally proactive, especially when a behavior activates one of three central human needs: the need to feel in command of one's life (autonomy); the need to form solid social bonds with family and friends (relatedness); and the need to feel effective when dealing with the external environment- learning new skills and overcoming challenges (competence). Though addictive behaviors are designed to soothe psychological discomfort, they also tend to frustrate one or more of these needs. A motivational interview makes that frustration clear: if you're asked how your Instagram use affects your well-being, you're going to see that it's compromising your productivity, your relationships, or both. Far from rendering a person powerless in the face of her addiction, she's left to feel both motivated and capable of changing for the better.

A well-designed environment encourages good habits and healthy behavior; the wrong environment brings excess and- at the extremes- behavioral addiction.

**Chapter 11: Habits and Architecture**

The key to overcoming addictive behaviors, then, is to replace them with something else. That's the logic behind nicotine gum, which serves as a bridge between smoking and quitting. One of the things that smokers miss about cigarettes is the comforting sensation of having the cigarette balanced between their lips- a signal that nicotine will arrive shortly. That sensation continues to give comfort for a while after the smoker quits, which is why you can spot a recent non-smoker by his trial of chewed-on ballpoint pens. Nicotine gum is an effective bridge in part because it administers declining doses of nicotine, but also because it's an oral distraction.

An innovation agency called The Company of Others seems to understand the value of replacing bad routines with good. The agency explains on its website that “we live and think ahead of the trend,” and one of those trends is the rise of smartphone addiction. In 2014, The Company of Others launched a product called Realism. Billed as “the smart device for the good of humanity,” Realism was designed to treat smartphone addiction. The simple device is an attractive plastic frame that looks like a smartphone without a screen. On one level it's a wry critique of how smartphones remove us from the here and now. Instead of looking at a screen, you could look through a screen-sized frame at what's actually in front of you.

Building a new habit is difficult. We know this because the same people seem to make the same resolutions every January. According to one study, roughly half of all Americans make New Year's resolutions- most of them to lose weight, exercise more often, or stop smoking. Three quarters stick to their resolutions through January, but by June roughly half report family. By the following December most are back making the same resolution they made a year earlier.

There is one subtle psychological lever that seems to hasten habit formation: the language you use to describe your behavior. Suppose you were trying to avoid using Facebook. Each time you're tempted, you can either tell yourself “I can't use Facebook,” or you can tell yourself “I don't use Facebook.” They sound similar, and the difference may seem trivial, but it isn't. “I can't” wrests control from you and gives it to an unnamed outside agent. It's disempowering. In contrast, “I don't” is an empowering declaration that this isn't something you do. It gives the power to you and signals that you're a particular kind of person- the kind of person who, on principle, doesn't use Facebook.

We know this works because two consumer behavior researchers, Vanessa Patrick and Henrik Hagtvedt Ran, conducted an experiment using the technique. They asked a group of women to think of a meaningful long-term health goal, like exercising three times a week or eating healthier food. The researchers explained that the women would face challenges on their quest to live healthier lives, and that they should deal with temptation with self-talk. Faced with the prospect of exercising after a long day of work, for example, one group was told to say, “I can't miss my workouts,” while the other was told to say, “I don't miss my workouts.” After ten days the women returned to the lab and reported on their progress. Just 10 percent of the women persisted with their goal when they were told to say, “I can't,” whereas a full 80 percent persisted when they said, “I don't.” The right words seem to help, but overturning addiction is certainly more complicated than saying “I don't” whenever you're tempted to regress.

Behavioral architecture acknowledges that you can’t escape temptation completely. You can't stop using your phone altogether, but you can aim to use it less often. You can avoid checking email, but life should be compartmentalized so refreshing your email account isn't always an option. Smartphones are ubiquitous; if you own wearable tech, it doesn't leave your body while you're awake (and sometimes while you're asleep as well).

The first principle of behavioral architecture, then, is very simple: whatever is nearby will have a bigger impact on your mental life than whatever is farther away. Surround yourself with temptation and you'll be tempted; remove temptation from arms reach and you'll find hidden reserves of willpower. Proximity is so powerful that it even drives which strangers you'll befriend.

But not all addictive experiences are bad. In theory, the same hooks that drive addiction can also be harnessed to drive healthier eating, regular exercise, retirement saving, charitable giving, and committed studying. Sometimes, the problem isn't that we’re addicted to the wrong kinds of behaviors, but rather that we abandon the right kinds. Behavioral architecture isn't just a tool for doing less of the wrong things; it's also a tool for doing more of the right things.

**Chapter 12: Gamification**

There are two ways to approach behavioral addictions: eliminate them or harness them. Elimination was the subject of the first eleven chapters of *Irresistible*, but it's possible to channel the forces of harmful behavioral addiction for the good. The human tendencies that enslave us to smartphones, tablets, and video games also prepare us to do good: to eat better, exercise more, work smarter, behave more generously, and save more money. To be sure, there's a fine line between behavioral addictions and helpful habits, and it's important to keep that line in mind. The same Fitbit that fuels exercise addiction and eating disorders in some people pushes others to leave the couch behind during an hour of exercise. If you're a couch potato who hates to exercise, a dose of motivation can only help.

A broad survey of human behavior reveals plenty of room for improvement. Sixty percent of the world's developed population is overweight or obese, including 67 percent of Americans. Graduation rates in the United States are declining at every education level, from elementary school to four-year colleges.

Almost everyone wants to change at least one behavior. For some, its spending too much and saving too little; for others, it's wasting nine tenths of the work day checking emails; for others, still, eating too much or exercising too little. The obvious path to change is with effort, but willpower is limited. People are more likely to do the right thing if the right thing happens to be fun.

*Gamification* involves taking a non-game experience and turning it into a game. The central theme of gamification is that the experience itself should be its own reward. Gamification is a powerful business tool, and harnessed appropriately it also drives happier, healthier, and wiser behavior. Games just happened to do an excellent job of relieving pain, replacing boredom with joy, merging fun with generosity.

**Epilogue**

Half of the developed world is addicted to something, and for most people that something is a behavior. We're hooked on our phones and email and video games and TV and work and shopping and exercise and a long list of other experiences that exist on the back of rapid technological growth and sophisticated product design. What we do know is that the number of immersive and addictive experiences is rising at an accelerating rate, so we need to understand how, why, and when people first develop and then escape behavioral addictions. On the lofty end of the spectrum, our health, happiness, and well-being depend on it- and right here, down to earth, so does our ability to look one another in the eyes to form genuine emotional connections.

A decade ago, who could have imagined that Facebook would attract 1.5 billion users, many of whom say they wished they spent less time on this site? Or that millions of Instagram users would spend hours uploading and liking the sixty million new photos the app hosts every day?

So what's the solution? We can't abandon technology, nor should we. Some technological advances fuel behavioral addiction, but they are also miraculous and life enriching. And with careful engineering they don't need to be addictive. It's possible to create a product or experience that is indispensable but not addictive. Children can be introduced to screens slowly with supervision, rather than all at once. Our attitude to addictive experiences is largely cultural, and if our culture makes space for work-free, game-free, screen-free downtime, we and our children will find it easier to resist the lure of behavioral addiction. In its place, we’ll communicate with one another directly, rather than through devices, and the glow of these social bonds will leave us richer and happier than the glow of screens ever could.