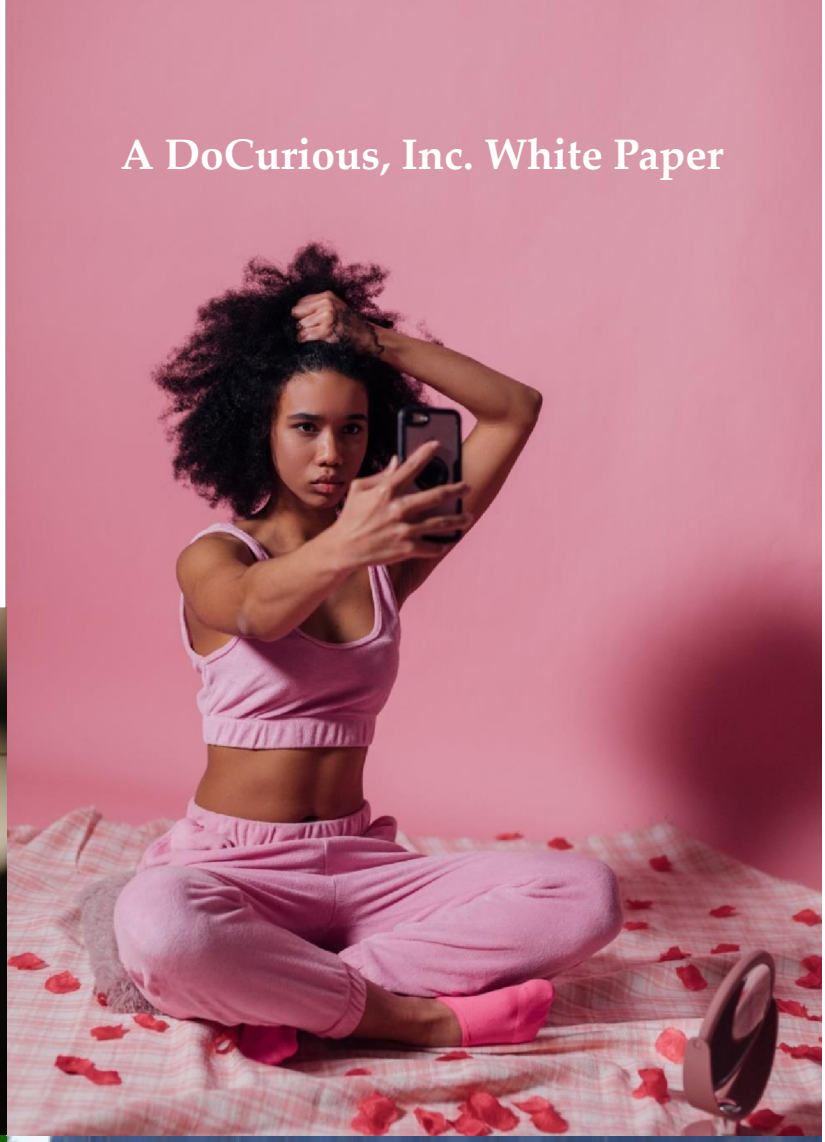
The Science Behind Moving People Away from Screens and Toward Happier,More Fulfilling Lives

A DoCurious, Inc. White Paper









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Executive Summary

Smartphones and computers have become an integral part of the fabric of modern society. We rely on them every day for the information, communication, work, and recreation opportunities that they provide. Used properly they are a great asset. Unfortunately, they are simultaneously proving to be a social, mental, and physical health disaster for millions of young people all around the world. The sheer number of hours spent on-line, the nature of the content, and deliberate psychological manipulation by Big Tech content providers all contribute to a dramatic increase in apathy, low self-esteem, loneliness, depression, and suicide that has occurred since 2011.

This paper describes the nature and extent of the problem, the science behind problematic screen use, and how specific psychological tools can be employed to voluntarily move people away from problematic screen use and into happier and more fulfilling lives. We observe that a toxic combination of technology and psychology are responsible for the current situation. Only a competing, positive combination of technology, psychology, and a deliberate effort to return people to real-world in-person activities and relationships is likely to correct it.

About DoCurious

DoCurious, Inc. is a for-profit company based in the United States. Our mission is to build positive engagement, relationships, meaning and achievement in our customers by linking them to a lifetime of challenging real-world experiences offered by a host of local small-business partners. The DoCurious approach promotes long-term happiness and satisfaction in individuals, and prosperity in local communities. For more information, please visit www.DoCurious.com.

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Introduction

Digital technologies and the Internet have had a profound impact on information, communication, and society. Many of these changes have been positive. It is now possible to access information on anything from paleontology to home repair virtually anywhere with just a few keystrokes and clicks, and it has never been easier to communicate with friends and family. Clearly not all screen use is a problem, despite the fact that almost all of us are at least somewhat addicted to our smartphones, computers, and televisions.

However the downside of being "always connected" is that many people now spend virtually *all* of their free time on-line or in front the TV. It is now apparent that this is having a destructive impact on the lives of and health of millions of people in the United States alone. Exactly how and why, and what can be done about it, is the subject of this paper.

The Impact of Screen Time on Human Health

Since the introduction of the iPhone in 2007, screens have come to dominate the lives of billions of people. Across the developed world, we now spend an average of 6 hours and 55 minutes staring at screens each day – almost half of our waking lives. In the U.S. the average is 7 hours and 11 minutes; in the United Kingdom, it's 6 hours and 25 minutes. And in the Philippines, Brazil, Colombia, and South Africa, people spend an average of *over 10 hours each day* in front of computers, cell phones, and televisions.[1]

Those most affected by skyrocketing levels of screen use are young people under the age of 35. In 2021, American teenagers spent an average of 8 hours and 39 minutes per day looking at screens in their free time – up 17% from 2019.[2] Ofcom found that adolescents' screen-time doubled from 2005 to 2015.[3] Nielsen data shows that screen time further spiked after COVID, from 8 hours a day in 2018 to 13 hours a day in 2020.[4]

Spending huge portions of our lives in front of screens – often to the exclusion of nearly everything else – is something that people were never designed for. A million years of human evolution structured our minds and bodies to reward face-to-face social behavior and cooperation, an active lifestyle, and intellectual curiosity. There is considerable evidence that replacing these behaviors with screen time is harming, and even killing us, both mentally and physically. The impact is seen nearly everywhere one looks:

1. Excess Weight Gain and Obesity - From the Journal of Pediatrics, 2017:

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"Obesity is one of the best-documented outcomes of screen media exposure. Many observational studies find relationships between screen media exposure and increased risks of obesity. Randomized controlled trials of reducing screen time in community settings have reduced weight gain in children, demonstrating a cause and effect relationship. Current evidence suggests that screen media exposure leads to obesity in children and adolescents through increased eating while viewing; exposure to high-calorie, low-nutrient food and beverage marketing that influences children's preferences, purchase requests, consumption habits; and reduced sleep duration."[5]

2. Eye Problems – Both experimental and observational studies have demonstrated that high levels of smartphone and computer use are directly associated with myopia (nearsightedness) and dry eye, particularly in young people.[6,7,8]

> "In just four decades, U.S. myopia prevalence has gone from 25% of Americans to about 42%, while a 2018 study of 60,800 children in southern California found 59% of 17- to 19-year-olds were myopic."[9,10]

3. Lack of Interest and Curiosity, Reduced Ability to Cope, Inability to Finish Tasks – In 2018, Twenge and Campbell published a study documenting the relationship between screen time and psychological well-being in young people. As shown below, three of their most interesting findings were that higher levels of screen time were associated with: (1) lower levels of curiosity and interest in learning new things; (2) a reduced ability to remain calm when challenged; and (3) an inability to finish tasks that they had started.

> "After 1 h/day of use, more hours of daily screen time were associated with lower psychological well-being, including less curiosity, lower selfcontrol, more distractibility, more difficulty making friends, less emotional stability, being more difficult to care for, and inability to finish tasks." [11]

These results were all statistically significant.

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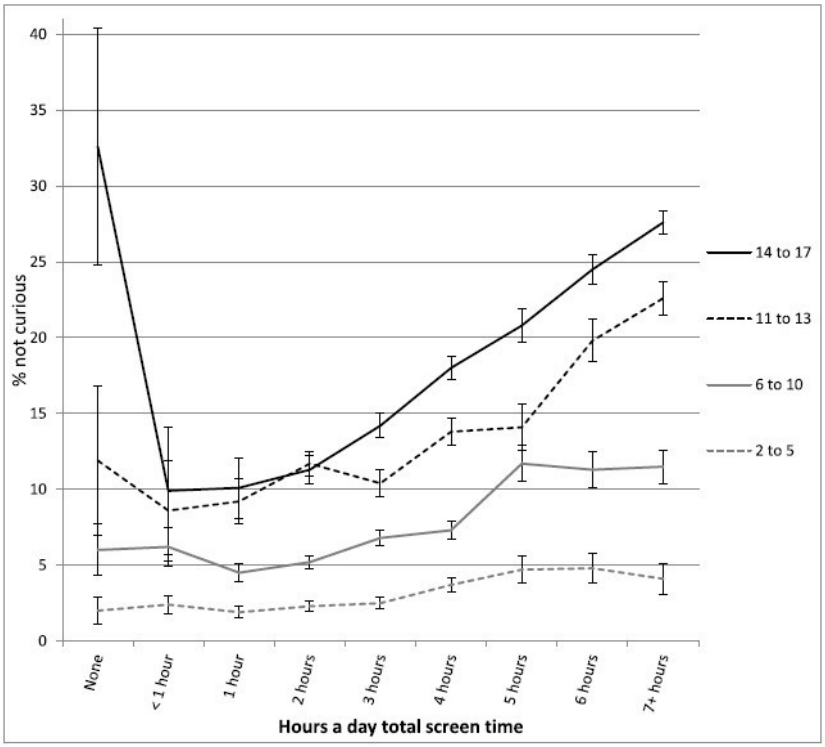


Fig. 3. Percentage not curious or interested in learning new things, by age and level of screen time, with controls, U.S., 2016. Error bars are ± 1 SE.

Figure 1: Impact of screen time on curiosity and interest in learning new things

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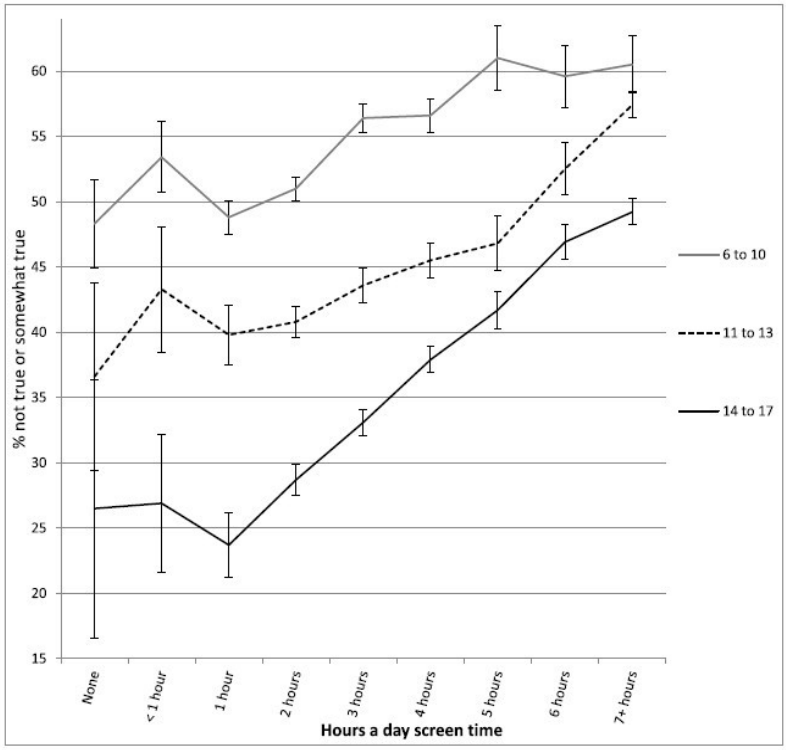


Fig. 4. Percentage who do not stay calm when challenged, by age and level of screen time, with controls, U.S., 2016. Error bars are ± 1 SE.

Figure 2: Impact of screen time on ability to stay calm when challenged

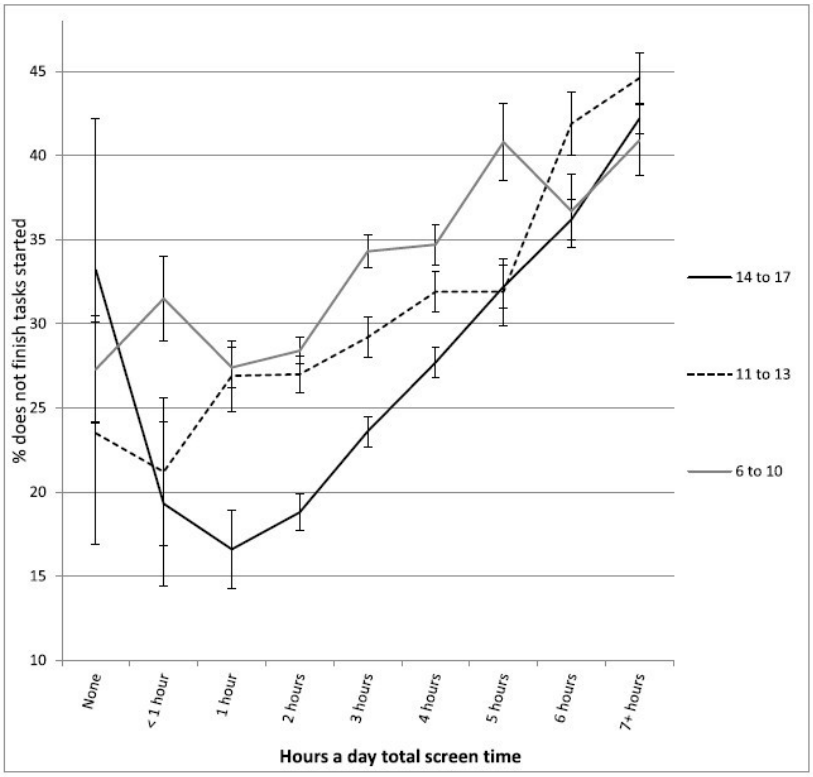


Fig. 5. Percentage who do not finish tasks started, by age and level of screen time, with controls, U.S., 2016. Error bars are ± 1 SE.

Figure 3: Impact of screen time on ability to finish tasks

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4. Loneliness – Although the iPhone was introduced in 2007, it took until 2011 for smartphone ownership to become widespread. By 2020, 85% of American 14 year-olds owned a smartphone and used social media.[12]

   A 1976 to 2017 study of 8.2 million U.S. students (age: 13-18) showed that as Internet and social media use increased, an entire generation of young people growing up in the 2010s began spending less time on in-person, face-to-face social interactions with their peers. This included socializing with friends, going to parties, going out, and even dating. As shown in the two graphs below, lower levels of in-person interaction have been accompanied by a dramatic, statistically significant, corresponding increase in feelings of loneliness.[13]

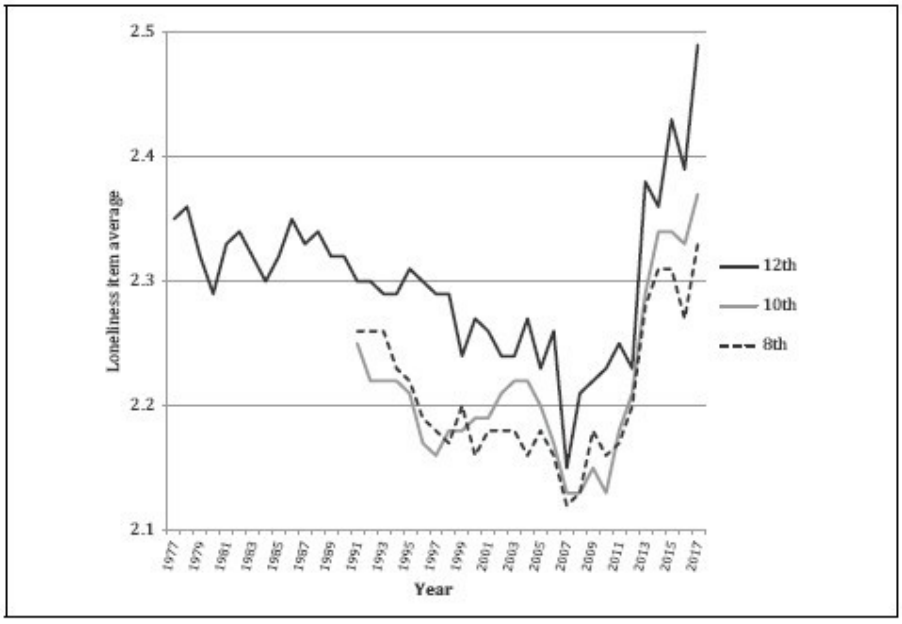


Figure 5. Mean loneliness, 6-item scale, U.S. 8th, 10th, and 12th graders, 1977–2017.

Figure 4: Loneliness in U.S. teenagers, 1977-2017

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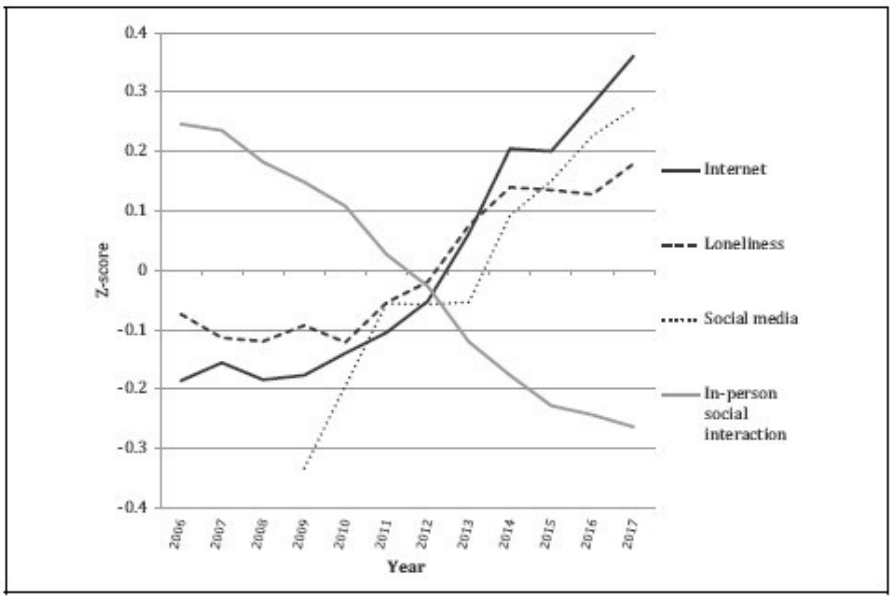


Figure 6. Internet use, loneliness, social media use, and time spent on in-person social interaction (Z-scored), U.S. 10th graders, 2006–2017. *Note.* Data on Internet and social media use adapted from Twenge et al. (2018).

Figure 5: Internet use, loneliness, social media use, and in-person social interaction in U.S. 10th graders, 2006-2017

5. Depression and Suicide – For obvious reasons, no potential side effect of screen use is more worrisome than the generational increase in depression and suicide after the widespread introduction of smartphones and social media. In 2020, a review of the topic found that:

> "After remaining stable during the early 2000s, the prevalence of mental health issues among U.S. adolescents and young adults began to rise in the early 2010s. These trends included sharp increases in depression, anxiety, loneliness, self-harm, suicidal ideation, suicide attempts, and suicide, with increases more pronounced among girls and young women. There is a growing consensus that these trends may be connected to the rise in technology use. Increased digital media and smartphone use may influence mental health via several mechanisms, including displacement of time spent in in-person social interactions, individually and across the generation, as adolescent cultural norms evolve; disruption of in-person social interactions; interference with sleep time and quality; cyberbullying and toxic online environments; and online contagion and information about self-harm." [14]

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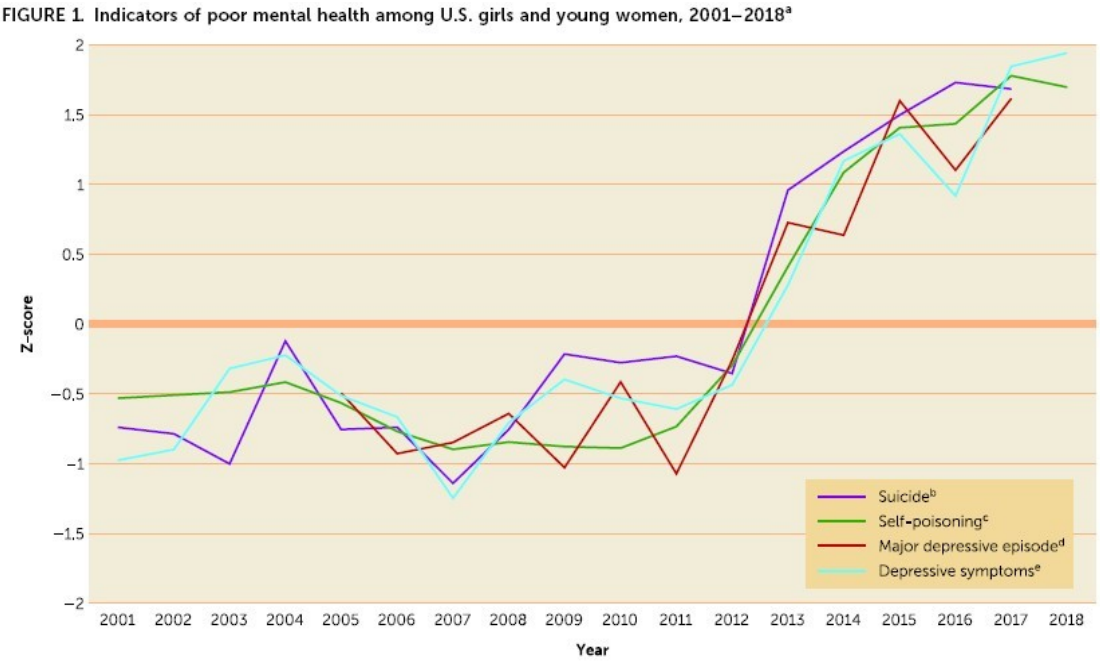


Figure 6: Depression and suicide trends in U.S. girls and young women, 2001-2018

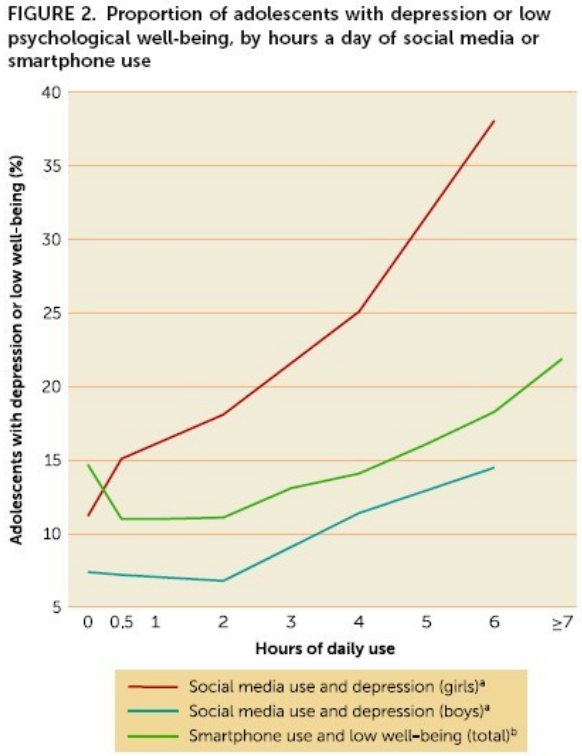


Figure 7: Relationship between intensity of social media and smartphone use and depression in adolescents

In short, young people today are spending virtually all of their free time in front of screens watching videos, browsing websites, and using social media, and it's having a

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profoundly negative impact on their physical and mental health. But can we say that mere screen-time itself is the problem? Perhaps it depends on how the person *uses* the screen-time, or what *content* they access.

How We Spend Our Time Matters

Przybylski and Weinstein (2016) conducted the most authoritative test of the relationship between simple screen-time and measured well-being, in a study of more than 100,000 British adolescents. They found strong support for their "Goldilocks" (i.e. moderation) hypothesis, which stated that increasing screen-time is beneficial up to a point (because it keeps youth connected and current), but it becomes negative for wellbeing after that point. This curvilinear effect emerged in all four types of screen-time they examined, including watching TV/movies, playing video games, using computers, and using smartphones. However, the inflection point occurred soonest for smartphones (as shown in Figure 8), such that after more than one hour of daily use, use began to have negative effects. In contrast, playing video-games had the right-most inflection point (Figure 9), such that playing only began to be problematic after three hours of daily use. The quickly diminishing returns of high smartphone use in particular are striking, given that smartphones are the most ubiquitous means of digital contact, for most people.

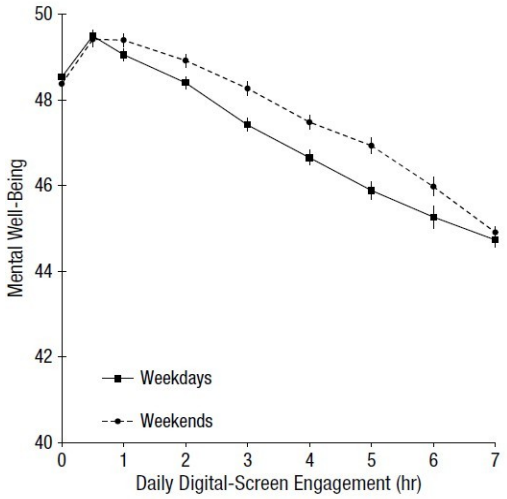


Figure 8: Association of increasing smartphone use with well-being

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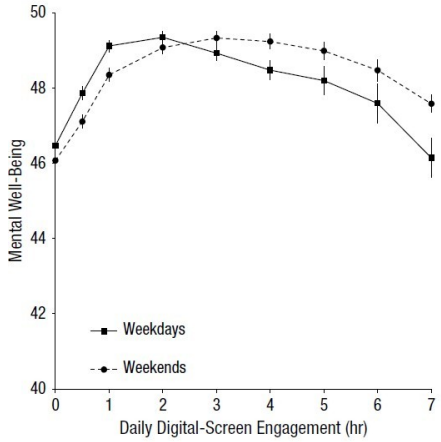


Figure 9: Association of increasing video gaming with well-being

Regardless of which form of digital engagement is "worst" in large doses, or how soon it turns from benefit to burden, it's clear that large doses are problematic.

Why People Spend So Much Time Staring at Screens

When devising a strategy to get people away from screens, it is important to understand exactly why screens have "suddenly" become so addictive over the past decade or so. After all, screens have been available in the form of televisions and computers for generations without incurring significant increases in listlessness, depression, and suicide. What has changed? The answer lies at the intersection of neurobiology and digital technology; and more specifically with the chemistry of pleasure, pain, and anxiety.

Pleasure and pain are the tools that evolution uses to craft the behavior of organisms. Actions that have helped us survive over millions of years – eating, drinking, exploring, noticing changes in the environment, social approval, and having sex – are rewarded by having neurotransmitters (and related hormones) stimulate the pleasure centers of our brain. Things that tend to harm us – physical or mental threats, thirst, starvation, and social alienation – use neurotransmitters (and related hormones) to elicit anxiety, discomfort or pain. Both systems are active and release a basal level of neurotransmitters at all times, but a normal productive life requires that the systems are in balance, and appropriately responsive to the person's actual life-circumstances.[1,15]

1 One might think that a constant state of feeling pleasure would be ideal, but throughout most of human evolution it would be fatal. If one is experiencing a constant state of pleasure there is a great reluctance to interrupt it with more painful activities such as hunting, building, or competing. The state of wanting is critical to survival, even in the modern world. Heroin or cocaine users on a continuous high ha[illegible]

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The key to rewarding behavior in the brain is the neurotransmitter dopamine. Dopamine directly stimulates several locations within the brain, including the mesolimbic pleasure reward site in the nucleus accumbens. However one of dopamine's most important functions is to cause us to *seek* stimuli or rewards that are pleasurable or satisfying.[16] This function of dopamine gives us a "thrill" or "rush" that is key to exploration and learning.[†] Young people – teenagers through the early twenties – are especially responsive to dopamine.[17,‡]

Dopamine is a final common pathway that comes into play for nearly all rewardmotivated experiences, including pleasure, intoxication, and addiction.[18] Certain chemicals can independently trigger dopamine release; the more and faster they release dopamine, the more addictive they are. Chocolate increases dopamine levels 55% above baseline, nicotine by about 150%, while methamphetamine increases dopamine levels by an astonishing 1,000% above baseline.[19] Activities can also cause dopamine release. Sex and playing video games both produce dopamine levels that are 100% above baseline – this is similar to an injection of amphetamine.[20,21]

It is important to understand that simply *seeking* or *anticipating* a reward can cause dopamine to be released. The thrill of the chase can be even more rewarding than the prize itself. This is what causes gamblers to continue to pull the lever on a slot machine or to throw the dice even when they're losing. In fact, the offer of a "variable reward" – one in which you don't know what type of reward you're going to get or when it will occur – is one of the most potent motivators of repetitive behavior known to man.[22]

The problem, however, is that constantly flooding the brain with pleasure causes it to down-regulate its dopamine receptors, and therefore its sensitivity to dopamine.[23] Not only are increasing levels of stimulation required to maintain the same level of pleasurable excitement, but removing sources of stimulation, whether chocolate, nicotine, amphetamines, or a cell phone, produces symptoms of dopamine withdrawal: discomfort, anxiety, dysphoria, restlessness and irritability. This need to be continually stimulated, or suffer the consequences, is the underlying mechanism behind all forms of addiction. The symptoms of withdrawal will fade with time as dopamine receptors are gradually upregulated by the brain.

As it happens, digital technologies can also be a great way of stimulating the release of dopamine. Big Tech companies like Facebook, YouTube, Snapchat, Twitter, and

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time surviving in the wild, (and even in civilization, for that matter). The other extreme - experiencing constant pain, anxiety, and depression – is, of course, equally undesirable.

† Dopamine highs should be familiar to anyone who has been excited by the prospect of gifts to be received on Christmas morning, anticipated a delicious meal, travelled and explored for pleasure, or courted a potential lover.

‡ Evolutionarily this makes perfect sense. Learning is a process of exploration. The incentive provided by dopamine plays a major role in encouraging both.

TikTok have found that the prospect of dopamine highs can induce people to stare at screens and interact with them for hours on end. They do this to sell advertising. The business model is simple: the more time people spend looking at their screens, the more advertising is viewed, and the more money they make. To create a series of dopamine highs, all of these companies utilize four specific steps described by Eyal and Hoover in "Hooked, How to Build Habit-Forming Products".[24]

1. Provide a *trigger* to let the user know that a potentially pleasurable reward is available. Classic triggers include the ding of a text notification, an announcement that "You've Got Mail", "Brian liked your post", or even "It's been a while since you checked your Facebook page. See what's new". The trigger generates a desire to know what the reward is, and a sense of anticipation.

2. Get the user take an *action* to receive the reward, such as picking up a phone, clicking on a link, or opening an application.

3. Provide a *reward*. The reward could be visual (an appealing photo or video), auditory (music, a lecture, or discussion), message based (e-mail, texts, or tweets), or social ("likes", comments, emojis, or followers). To maximize user response and dopamine release, the reward should be *variable* with respect to content, time interval, importance, or some other quality.

4. Ask the user to take an *action* that will set up the next trigger. For example, they might be prompted to rate the extent to which they liked the content presented, respond with a comment or like of their own, or share the content with others. Some of these actions can be incredibly subtle. For example, TikTok measures the number of seconds that each user spends looking at a specific video. TikTok's algorithm will then use that information to determine exactly what type of video to show next.[25]

When this sequence of events is followed, each trigger and reward is associated with a release of dopamine as the user races to look at her screen. Repeated, continuous digital stimulation will gradually downregulate dopamine receptor response. At that

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point, *failing to check one's screens* will lead to screen withdrawal-associated anxiety, discomfort, and dysphoria. Users actually come to fear missing out on an opportunity to be stimulated visually, audibly, socially, or via message.

The system clearly works. Seventy-eight percent of teens check their phones at least hourly and 72% "feel the need to immediately respond to texts, social-networking messages, and other notifications". Fully 50% of teens describe themselves as feeling addicted to their mobile devices.[26]

While this basic approach to capturing and retaining screen users has been in use since 2000, two major changes since 2007 have increased its effectiveness dramatically.

The first was the development and widespread distribution of the smartphone. Smartphones made it possible for tech companies to trigger anyone, anywhere, anytime. This made it possible to create dopamine responses in their users on a nearly continuous basis; all they had to do was be awake. Smartphones turned screen use from an occasional event that required being seated in front of a computer, into a constant habit – one that became increasingly painful and difficult to break.

The second was an exponential increase in the level of complexity and sophistication of tech company strategies and algorithms for triggering users. As discussed in both the documentary movie *The Social Dilemma* and the 60 Minutes episode entitled *Brain Hacking*, tech companies now employ scores of psychologists and developers whose only job is creating more efficient and effective triggers and rewards.[27,28] Rather than guessing about user responses, companies like Facebook, Instagram, Alphabet, and TikTok continually run thousands of "Trigger A vs. Trigger B" and "Reward A vs. Reward B" experiments on their users to determine which is more effective. Sophisticated algorithms use artificial intelligence to determine what types of cues and rewards to use for different types of users based upon a host of different parameters. These adjust automatically over time, maximizing screen time as each individual's life circumstances change. The more time users spend in front of their screens, the more effectively tech companies can work to keep them there.

Approaching Excessive Screen Time as a Form of Addiction

There is no question that many Big Tech and social media companies have designed their digital offerings to function psychologically in exactly the same way as an addictive drug. It really makes no difference whether the input sold is a chemical

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substance or patterns of messaging and pixels on a screen; the end result in the brain is virtually identical.[2]

The only certain way to fully upregulate dopamine receptors and restore pleasure/pain balance in the brain is to avoid the addictive input entirely. This is clearly impractical in a society where screens are ubiquitous, and often even required for school and work. Reducing the *dose* of screen time can clearly help. Hunt and her colleagues at the University of Pennsylvania found that reducing social media use to roughly 30 minutes per day over a three week period significantly reduced loneliness and depression in college students.[29] This is an approach that China took in 2021 by compelling companies to limit players' access to videogames to just a few hours per week. But there is another powerful, but subtle means of countering addictive behavior based upon enriching the physical and social environment we live in.

In the late 1970s, Canadian psychologist Bruce Alexander and colleagues ran a series of experiments that examined the voluntary self-administration of cocaine in rats.[30,31] They discovered that rats in a standard caged environment consumed far more cocaine than rats who had access to an enriched environment called the "Rat Park" that contained other rats to socialize with and interesting activities. The difference was quite dramatic. **Rats who used cocaine heavily in an isolated environment even *voluntarily* weaned themselves from the drug when placed in the enriched environment.**

The counter-addictive impact of enriched environment has since been confirmed and expanded upon by many other researchers, and for several different types of addictive drugs.[32,33,34,35] Experiments have specifically found that, compared to standard conditions, animals in an enriched environment are more resistant to addiction, tend to lose their appetite for drugs, are less likely to relapse, and that environmental enrichment during the early stages of life substantially reduced the behavioral, neurochemical, and molecular effects of cocaine later on. Both social and non-social elements play a role in the results.

The key lesson of the Rat Park and subsequent experiments is that the brain is a complex place; *at any point in time current or potential addictions are directly competing with our other desires, experiences, and relationships for time and attention*. The psychological and behavioral outcome is determined by the strength and appeal of the former relative to

2 Addictive things do not affect all people in the same way. When exposed to most addictive drugs or other stimuli, only small percentage of the population becomes helplessly addicted and unable to function. Instead any adverse impact depends upon the dosage and frequency of exposure, the genetics of the individual involved, and a number of other environmental circumstances. How much harm is caused to any individual will fall on a spectrum of little or none to a great deal. The goal is to limit that harm as much as is realistically possible.

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the latter. In other words, people are far more likely to suffer addiction and harm from screens if they are bored, isolated, and/or lonely in the first place. Therefore any successful strategy for improving human health – both mental and physical – should not only reduce screen time but also expand opportunities for the sorts of positive physical, mental, and social interactions that allow individuals to thrive on their own.

The primary advantages that screens have in competing for our minds are that they are fast, ubiquitous, often free, and utilize a simple but effective strategy for releasing dopamine. They also make it hard to quit by downregulating dopamine receptors. The disadvantage that screens have is that they are inherently shallow. As shown by the lure of enriched environments, brains have evolved to both need and want far more than screens (or drugs) can supply. This gives us an opportunity to exploit what we know about human well-being and satisfaction to out-compete the screens by returning people to a more normal "real-life"-centric enriched environment.

Out-Competing Screens: Positive Psychology and the Science of WellBeing

Throughout most of its history the science of psychology was limited to Behavioral Psychology; understanding and modifying individuals' thoughts, feelings, and behaviors, reactions to stimuli, conditioning, addiction, the environment, and psychotherapy. Behavioral psychology is central to understanding the role screens play in our lives – especially the "Hooked" model of trigger, action, and reward.

However by the end of the 20th century it became apparent that while behavioral psychology could help us understand many mental actions and reactions, it offered little or no understanding of what made people actually thrive or flourish in life. Just as the absence of disease does not make a body fit and strong, the absence of mental illness does not make for a life well-lived. In 1999 and 2000, a group of psychologists and researchers (including one of the authors (KS)) founded the field of Positive Psychology to specifically study what makes people thrive:[36]

> "Positive Psychology is the scientific study of optimal human functioning. It aims to discover and promote the factors that allow individuals and communities to thrive. The positive psychology movement represents a new commitment on the part of research psychologists to focus attention upon the sources of psychological health, thereby going beyond prior emphases upon disease and disorder."

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The idea of good psychological health and thriving are typically incorporated into the term "well-being". Since the founding of positive psychology over 20 years ago, the scientific understanding of the nature of well-being, and what produces it, has grown rapidly. Research has now shown that there are actually two separate components of well-being: "hedonic well-being" (HWB) and "eudaimonic" well-being (EWB). Both are needed to thrive.

Hedonic well-being consists of positive emotions such as joy, excitement and pleasure. HWB also consists of the absence of negative emotions, like distress, depression, or anxiety. HWB isn't necessarily shallow, superficial, or superfluous, as some might think; we now know that positive emotions are essential for our health and functioning and that negative emotions can be harmful, especially if they are chronic. [37] Positive emotions help us in many ways, lubricating the gears of social interactions and giving us the confidence we need to try for what we want.[38]

Up until 2000 measures of HWB had long dominated in psychology, the main research question being: "what makes people happy?" (i.e., what activities or behaviors bring people increased positive emotion and decreased negative emotion?). However the primary implication of this research (i.e., that HWB is the "be all and end all" of existence), fails to explain a great deal of highly prized and universal human tendencies, emotions, and behaviors. These include things like pride, satisfaction, striving, meaningful relationships, a sense of personal mission, and accomplishment.

The idea that "there is more to a good life than pleasure" is reflected in the concept and component of "eudaimonic well-being" (EWB). As first described by Aristotle in his Nicomachean ethics, "eudaimonia is activity of the soul in accord with virtue." "The ultimate end of human acts is eudaimonia, happiness in the sense of living well, which all men desire." The concept of eudaimonic well-being is very broad, and its scope is still being debated. However, a number of neuroscience and behavioral genetics studies have begun to show that eudaimonia is not only real, but that the biological basis for it can actually be pinpointed in the human brain and genome.[39,40,41]

One can define eudaimonia in terms of its effects: *eudaimonic behaviors are those that bring deep satisfactions, boosting the person's HWB as a kind of side-effect*.[3]The Eudaimonic Activity Model of well-being (EAM; see Figure 10) provides an up-to-date depiction of the relationship between EWB and HWB.[42] In the leftmost box, the EAM says that "doing well," i.e. behaving in eudaimonic ways, satisfies inherent psychological needs

3 This is fully consistent with Aristotle's view: Aristotle saw positive emotions as a natural reward for a life well lived. Although positive emotions are not the goal themselves, he believed that they reinforce good living nonetheless, and help to make virtue sustainable.

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(in the middle box; needs such as autonomy, competence, and relatedness).[43] *Behaving eudaimonically involves learning, connecting, exploring, and growing within an enriched environment* – as Aristotle said, it is "activity of the soul in accord with virtue." People achieving EWB feel frequent and strong positive emotions, and few negative emotions (HWB, the rightmost box in the diagram). This 3-step sequence summarizes many research findings of recent years showing, perhaps surprisingly to some, that virtuous behavior – of the sort we would recommend to our children – provides the most reliable route to HWB, because it satisfies our needs.

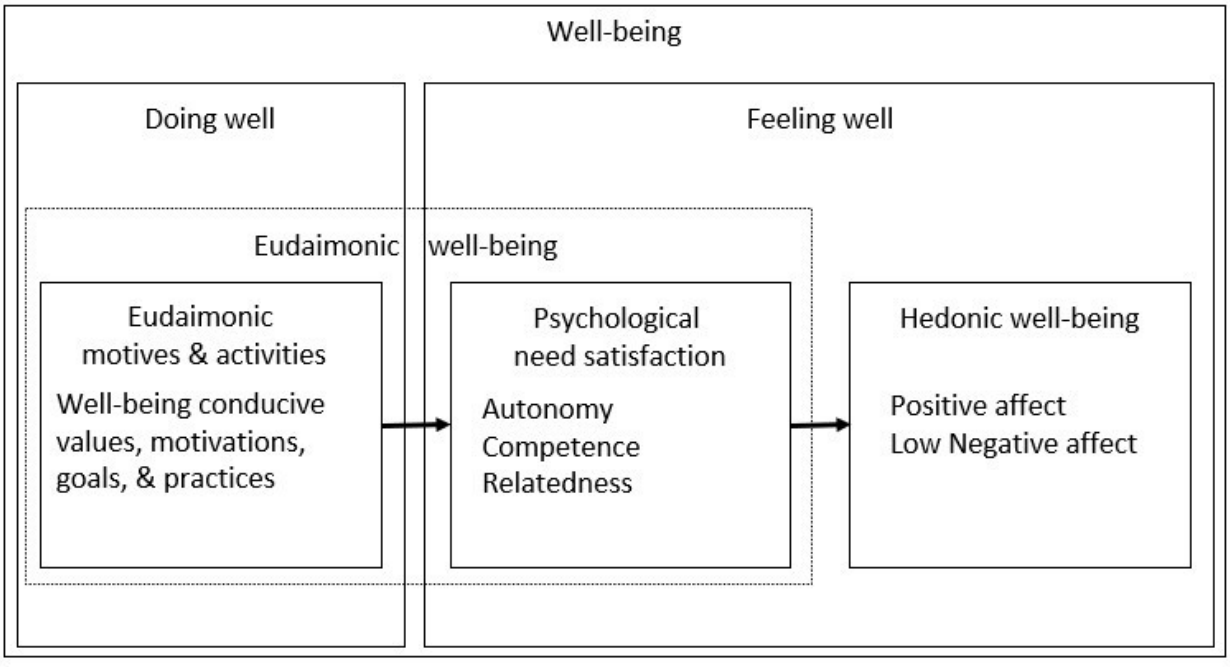


Figure 10: The Eudaimonic Activity Model of well-being

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HWB feels good. Many screen-users become stuck in a life-pattern in which they are getting at least some amount of HWB from their screens, and the dopamine hits they provide. However, those patterns of life-activity are largely failing to provide them with need satisfaction because they are not eudaimonic. Put simply, *people do not and cannot thrive in the absence of meaningful activities, relationships, and achievements*. Widespread use and distribution of drugs, screens, or anything else that take our time and keep us pre-occupied with short-term pleasure – while simultaneously displacing activities that generate EWB – inevitably lead to loneliness, depression, and a lack of self-esteem. This is exactly what we have seen happening since 2011.

The EAM also provides more insight as to why large amounts of screen time can be so destructive to mental health. The "Hooked" model of screen use used by virtually all Big Tech companies creates a vicious cycle in which people keep trying to compensate for reductions in genuine need-satisfaction via routes that provide momentary pleasures, but do not contribute to EWB.[44] As youths plunge deeper into the digital world, a void in EWB-based need satisfaction opens up and positive emotion declines. Seeking to fill that void, many of us are prone take the easy route to boost positive emotions with a steady stream of yet more screen-induced dopamine.[4] With little accomplished and little to look forward to, it is a relatively short step to feeling a sense of isolation, depression, and apathy. Depressed and isolated people tend to lose the internal resources (e.g., self-motivation, aspiration, and beneficial life habits) and external resources (e.g., friends, organizations, and outside facilities) required to break free and engage in EWB-producing activities. It is a classic vicious cycle.

People – especially young people – know that they are stuck at a low energy level, but do not really understand why. Our own 2021 nationwide survey showed that 60% of youth feel that the way they spend their spare time is dull, unsatisfying, and not challenging. 70% say that it's hard to find anything to do in real life, and 70% say it's hard to find people to do things with, in real life. They need a new route, or channel, by which to create such experiences.

Out-Competing Screens: Key Elements of a Solution

While EWB – which is essential in order to thrive – can produce HWB, the reverse is not true. This means that eudaimonic behaviors have the potential to sustainably outcompete behaviors (like screens) that are strictly hedonic in nature. Eudaimonic

4 This is very similar to how rats react to the availability of cocaine when living alone in empty cages with no ability to explore, achieve, or relate to others. Ironically, the "cages" are only psychological for humans; they can be left at any time. But leaving those cages and returning to real life requires people to leave their comfort zone.

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behaviors produce deep and lasting satisfactions in addition to momentary pleasures; conduce to the development of skills that become permanent parts of the person's behavioral repertoire; are likely to be implemented with attention to balance and appropriate moderation; and provide a sense of meaning and purpose, in addition to mere positive emotions. What's needed is a way to re-connect people with eudaimonic pursuits in the enriched environment of the real world.

There is no single formula for moving people away from screens; the enormous range of people, personal circumstances, and environments makes a single one-size-fitsall solution impossible. However research into screen use, positive psychology, and eudaimonic well-being allows us to identify several key elements in any broadly effective intervention.

1. Reduce the Dose

For all practical purposes, the brain's response to the dopamine released by screens is indistinguishable from its response to dopamine released by chocolate, nicotine, or cocaine; in each case dosage matters. The higher the dosage of stimulant, the more dopamine that is released and the more dopamine receptors are down-regulated. Therefore the most obvious way to break the cycle of addiction is abstain from, or at least reduce exposure to, the source of the problem.

There are several options for doing this. Usage of cell phone applications and other media can be limited by force (as is currently being done by China and many concerned parents), but this approach creates a very real risk of resentment and backlash. A second approach is to ask users to gradually reduce screen use to show them that they will feel better. This can be done by using an independent usage control application such as Screen Time or an internal control such as the "Digital Well Being" setting in TikTok. The best approach however, is to *displace* screen time with competing realworld experiences that produce both EWB and HWB.

2. Promote Experimentation

The EAM's essential prescription for a thriving life is relatively straightforward: Keep experimenting with new *real-world* behaviors and activities, seeking ones which express your best self, which allow you to achieve "activity of the soul in accordance with virtue." You'll know if you're on the right track if you start experiencing deep satisfactions. Such satisfactions will also cause you to experience strong HWB, as a side effect – a "glow" of positive emotion. Although strong positive emotions are not the point or goal themselves, experiencing them reinforces what we are doing, creating a new virtuous cycle of continual self-improvement.

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3. Make a Broad Range of High-Quality Real-Life Activities Easy to Find

Promoting experimentation implies that the person involved: (1) has a range of realworld activities available to them; and (2) that they know about them. As remarkable as it seems in this "information age", both of these are serious limitations for many people. As the world has moved toward computers and screens, traditional venues are offering less in the way of real-world alternatives to fewer people. Participation in scouting, for example, had been declining for years in both boys and girls before plunging to record lows in 2020. Most schools no longer offer traditional "hands on" activities such as shop (including wood and metal working, welding, mechanics, repair, etc.) or home economics (cooking, sewing, finance, design, etc.). Living life on-line has stifled imagination and narrowed our awareness of real-life opportunities considerably. As mentioned previously, 70% of young people surveyed – all of whom have ready access to search engines – said that it was hard to find something fun, interesting, and challenging to do in real-life.

Ensuring access to real-life experiences across a broad range of human endeavors is critical for generating life satisfaction that is both durable and long-lasting. The reason lies in Self-Determination Theory (SDT), pioneered by Edward Deci and Richard Ryan in the early 1970s. Today SDT remains the most comprehensive and best-proven motivation theory in the world, and its findings have positively influenced countless applied domains (i.e. sport, education, management, health, and much more).

SDT is complex, but its most essential concept is "intrinsic motivation" – in which we are doing what we *want* to be doing, by free choice. Intrinsic motivation is enjoyable – it *feels* good, inherently, and following intrinsic motivations promotes HWB. Thus, intrinsically motivated activity definitely counts as eudaimonic activity, since such activities bring EWB. Further consistent with the Eudaimonic Activity Model, following intrinsic motivations also coincides with personal growth and development. Intrinsic motivation represents the essence of the autonomous "active individual," engaging with self-selected tasks and interests, and learning in the process; it provides a *direct pipeline* for activating the best within the person.

What a given person finds to be intrinsically motivating is unique to the individual. The more different experiences and activities each person is exposed to, the greater the chance that he/she will successfully find the specific interests that are intrinsically motivating to them.

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4. Foster the Development of Real-World Relationships

EWB and SDT research have shown that having meaningful relationships (relatedness) is a universal psychological need. Relatedness denotes the experience of warmth, bonding, and care, and is satisfied by connecting to and feeling significant to others. Relatedness frustration can come with a sense of social alienation, exclusion, and loneliness.[45]

One of the greatest tragedies of screens is that they have disrupted both the extent and nature of real-life interpersonal interactions. As shown in the Figure 11, the number of times that teenagers go out with friends in person each week declined significantly between 2007 and 2015; it has absolutely plummeted since the advent of COVID.[46]

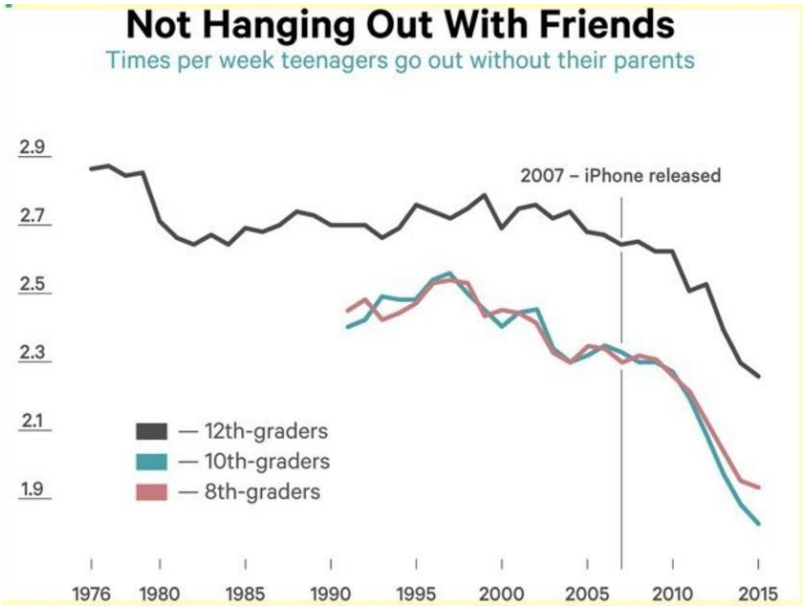


Figure 11: Frequency of teens going out with friends

A 2019 poll of American adults found that 45% of adults find it hard to make new friends, and 28% report not having any hobbies that allow them to meet new people.[47]

When it comes to relatedness, there is simply no substitute for having the opportunity to meet and interact with friends, or people who might become friends, in a non-threatening real-world setting; preferably in a situation where people are working together to achieve common goals.

5. Build Competence

Like autonomy and relatedness, feeling competent is a basic psychological need. Competence is derived from seeking achievement – trying to master skills that are just at the limit of one's current ability. Research clearly shows that people like the

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opportunity to meet goals, especially when those goals are concrete and do-able. When people are optimally challenged, they are more likely to enter "flow states," in which mind, consciousness and body are melded within a single seamless experience.[48] As shown by Csikszentmihalyi and colleagues, highly enjoyable flow states occur when people's skill levels (low/medium/high) are well matched to task-demands (low/medium/high). Because people like and seek out tasks based upon intrinsic motivation, they are their own best judge of what they are best prepared to take on next. They just need a proper channel in which to engage in this exploration and experimentation – a channel that perhaps starts on-line, but rapidly moves people offline and into the real world.

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Summary

Building upon decades of research by dozens of investigators, we have established the following:

- While extremely useful in moderate doses, excessive exposure to screens in the form of computers, smartphones, and television is proving to be a social, mental, and physical health disaster for millions of people – especially young people. Rapidly increasing amounts of screen time have created an epidemic of social isolation, apathy, learning difficulties, loneliness, depression, and even suicide.

- Within the brain, the dopamine release and pleasurable stimulation created by many forms of screen use is essentially indistinguishable from that caused by addictive drugs such as nicotine, cocaine, and amphetamines. Addiction to screens is a matter of degree; most of us are somewhat addicted to the screens we use. Whether our addiction is a problem depends upon the extent to which it crowds out other important activities and experiences. Young people are particularly susceptible to screen addiction because their brains are especially responsive to dopamine.

- Many Big Tech companies like Facebook, YouTube, TikTok, Snapchat, and Twitter deliberately design their technology and psychological techniques to be highly addictive as an integral part of their business model. The more users stare at screens, the more money these companies make. Since 2007, the combination of smartphones and sophisticated psychological response algorithms has made it possible to reach people with screen-based psychological triggers anywhere, 24 hours a day.

- Robust Positive Psychology research into what creates psychological health and the ability to thrive has identified two different components to well-being: "Hedonic Well-Being" (HWB) and Eudaimonic Well-Being (EWB). Both are critical to good psychological health. HWB is based solely upon positive emotions like joy, excitement, and pleasure, and the absence of pain. EWB is based upon the universal human need for deeper, more complex satisfactions like autonomy, competence, relatedness, and sense of mission and achievement. Screens and addictive drugs create HWB, but not EWB. Instead, they crowd out the relationships and activities that create EWB and dramatically reduce total well-being.

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- The best way to counter the negative impact of screens is to out-compete them by having people interact in a real-world environment rich in EWB-producing experiences. This can be done as follows:
    - Limit screen exposure either directly and/or by displacing it with engaging real-world activities;
    - Provide (and make people aware of) a real-world environment rich in alternative, challenging, real-world activities that will help generate EWB, and caters to the widest possible range of interests;
    - Encourage people to *behave* eudaimonically: learning, connecting, exploring, and growing within an enriched real-world environment;
    - Foster the development of both new and existing real-world relationships, preferably where people are working together toward a common goal;
    - Design real-world activities to maximize the creation of competence and achievement.

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