

Exploiting Human Nature: The Dark Side of the Technology in Our Pockets

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

CJ was a very bright high school student. He was sought after by many top-tier colleges, likely to get a free ride scholarship wherever he went. He had hobbies similarly to any other high school kid, like playing golf and watching “Doctor Who”. Also like his peers, CJ actively used popular social media platforms like Facebook, Instagram, and Snapchat. He used these apps more than most other kids, staying up late at night sending messages and pictures to friends and strangers. His habits caused him to become sleep deprived and obsessed with his body image. On an early January morning in 2015, CJ went to his bedroom, posted on Facebook the message “Who turned out the light?”, and proceeded to fatally shoot himself. His parents both firmly believed his suicide was due to his social media addiction, and filed wrongful death lawsuits against the social media companies responsible (Kelly, 2022).

Although CJ’s case was on the extreme end, mobile phone and social media usage is negatively impacting the mental health of adolescents. Despite the growing awareness among both parents and children to limit mobile phone and social media usage, many adolescents find themselves unable to control their phone usage. This is primarily due to the intentional design of social media applications to be inherently addictive. Algorithms to display content to keep users on the application, endless scrolling features, and streams of notifications are among features social media companies have been incorporating into their products to increase profits by breeding harmful relationships between adolescents and their mobile phones.

Research Methods

Two categories of evidence are used to support the claims made in this paper: Literature review and the case study of *Dopamine Nation* (Lembke, 2021). Literature review is used to provide peer-reviewed scientific evidence from experimental studies. Most of the studies discussed involve adolescent, or similar aged, individuals in studies regarding mobile phone and social media usage over time, and how these usages have correlated with different mental health attributes. All the studies discussed have been peer reviewed. Some rely on troublesome methods of data collection, like self-reporting, in results. Potential concerns with specific cases are addressed when they are referenced. Literature review is also used to get the opinions of experts on different fields I lacked a full understanding of. Examples of this are the design of mobile phones and social media, current legal news between various groups and large technology companies, the neuroscience behind brain structure and development, and the nature of addiction and its prevention. Overall, literature review allowed me to get a more full-picture view of the complex system that represents this problem.

Secondly, the book *Dopamine Nation* by Dr. Anna Lembke (Lembke, 2021) is used as a case study to review the psychology of addiction, and provide a basis for how to prevent addiction. *Dopamine Nation* was the primary motivation behind this research paper, and was an invaluable resource for digesting everything concerning addiction, especially amidst the exponential development and involvement of technology in our lives. The potential subjectivity of the claims made by Lembke are addressed, but the claims served as a solid ground for simplifying confusing concepts and creating discussion points.

Adolescent Dependence on Mobile Phones and Social Media

With the introduction of mobile phones and the subsequent creation of social media platforms in the 21st century, humans have begun to shift how they interact with each other. Instead of communicating solely through in-person conversations, humans, especially adolescents, have now been transferring to also interacting digitally. The act of people operating mobile phones, which have various communication capabilities such as texting, Facetiming, commenting or reacting on social media platforms, and more fit the criteria of an Actor-Network (Callon, 2001) (Crawford, 2020). The Actor-Network Theory is a methodology created in the 1980's that claims that actors in a sociotechnical system can be both human and non-human (Crawford, 2020). In this Actor-Network, the adolescent mobile phone users are the human actors, who interact with the non-human actor mobile phone, which contains the different social media platforms. Throughout this paper, the nature of a codependent relationship between the human and nonhuman actors will be explored: specifically, how adolescents and phones interact, and through the phones how adolescents and social media interact, to form a cohesive Actor-Network. The limitations of using this theory as a tool for problem solving will be examined as well.

This network can be expanded to other smart devices and applications that provide the same type of digital-based human interaction opportunities, as well as to more demographics of humans outside of adolescents. However, to increase simplicity and reduce redundancy, the non-human actors will be limited to mobile phones and social media. For the human actor, adolescents are most at risk of suffering from the maladaptive side effects of excessive mobile phone and social media usage. In a study called the Mental project conducted by German University students, 30,677 participants were selected, and tracked daily phone usage over the span of 4 weeks (Andone et al., 2016). The results of the Mental project found that age groups

12-17 used their phones the most, averaging 190 minutes daily. The study relied on self-reporting for times, which is not a reliable method of data collection. However, I still believe the study is useful due to the large-number of participants. Adolescents are also theorized to be the age group most at risk of developing an addiction (Christiansen, 2023), though this is not proven.

Mobile phone usage has skyrocketed in recent years. From 2005 to 2024, the percentage of American adults that own a cell phone has increased from 62% to 97% (Sidoti et al., 2024). From 2019 to 2024, the social network user penetration rate (percentage of a population using at least one social media platform) in the US increased from 84% to 92% (Statista, 2023). While not all Americans own mobile phones, and not all Americans who own mobile phones use social media, the data shows that a large majority of both these pools do. Mobile phones provide a unique kind of convenience and accessibility that no product has contained before, explaining the near-entirety of Americans that use mobile phones and social media. Mobile phones are incredibly useful for communication as well, keeping in touch with friends, staying informed and protected during emergencies, capturing photos, planning events, learning, and much more. If used the right way, mobile phones can be an extraordinary tool. Unfortunately, the design of mobile phones and social media has resulted in this not often being the case among adolescents, in favor of using the technology as a source of entertainment.

Mobile phone and social media companies profited tremendously from their initial introduction to the economy. The ability to digitally keep in touch with one's network of friends and family provided more than enough motivation to bring in new users. However, as more social media companies were introduced and further developed, competition has led to a redesign of the business model behind social media platforms: to capture as much of users' attention as possible (Blackstone LaunchPad, 2020). Since social media companies primarily profit from

users viewing advertisements, it makes sense that social media platforms are trying to maximize user attention. Syracuse's Blackstone LaunchPad article summarized the main takeaways from Netflix's documentary, *The Social Dilemma*, which highlights the "ills of modern social networking sites". The film points out that in order to capture our attention, addiction is built into the design of social media. Mike Brooks, Ph.D., creates the analogy that the addictiveness wired into mobile phones and social media platforms is the "Vegas Effect" (Brooks, 2019), since when we check our phones or open up a social media app there's a chance of hitting the "jackpot" of seeing a notification or an update in our feed, as a result, we repeatedly check over and over again, seeking the jackpot. A study conducted by Common Sense in partnership with the University of Michigan's Medical School tracked various statistics of preadolescent and adolescent mobile phone usage like application screen time usage, notifications received and interacted with, and background applications running. This was done using the Chronicle app, which has been peer reviewed and is a valid method of data collection (Radesky et al., 2023, p. 11). This study found that the median mobile phone social media notifications (excluding TikTok and Youtube) received among adolescents was 46.2 a day, with 23.6 of these notifications being interacted with (Radesky et al, 2023, p. 36). Interestingly enough, these social media apps only contributed to a median of 34 minutes of usage a day (Radesky et al, 2023, p. 28). This backs Brooks' analogy of the "Vegas Effect", showing that often adolescents check a likely enticing but meaningless social media notification, then quickly exit the application.

There are other ways social media companies have increased addictiveness. "Infinite scrolling" is a design in a user's feed where the content never ends, frictionlessly supplying continuous content which keeps the user engaged indefinitely (Koss, 2022). In 2023, Tik Tok held the largest amount of daily time American adults spent on any social media app with 53.8

minutes on average (Statista, 2023a). What makes Tik Tok so popular is its format of displaying content. Unlike other social media platforms, Tik Tok introduced and utilizes infinite scrolling as well as a shortened video format, as the “Vegas Effect” jackpot is hit more frequently as videos are being switched to and from faster. Other companies have shamelessly copied this style following its massive success. Instagram now has “Reels”, Snapchat now has “Spotlight”, and Youtube now has “Shorts”, all of which are essentially the same.

This style of formatting social media content is so successful due to our shortening attention spans. A study by Microsoft in 2000 found that the average attention span of teens and young adults was 12 seconds (Whalen, 2019). When the study was repeated in 2016, it was found to have dropped to 8 seconds. This study blew up, as an 8 second attention span is “lower than a goldfish’s”, and so inspired controversy about how an attention span was defined and measured. Although controversial, the method of data collection between 2000 and 2016 used the same EEG scans and the experimental methods were identical (Yirka & Xpress, 2015). So, although adolescent attention span may not quite be 8 seconds, it is safe to conclude that it has dropped from 2000, and this trend will likely continue. Furthermore, a study by CNN Health concluded that the average attention span on screen has decreased by 103 seconds from 2004 to 2023 (Hsu, 2023). Clearly different definitions of what constituted an attention span were used between the two studies, but the findings were consistent. Although not proven, many believe that mobile phones and social media have been contributing to our lowering attention spans.

Adolescents are growing up in an age where access to instant gratification (short term pleasure) stimuli is literally at the tip of their fingers. The first iPhone was created in 2007, and from 2010-2020, major social media apps like Instagram, Snapchat, TikTok, and BeReal were created. At the same time, according to *The Social Dilemma*, social media companies have been

perpetually updating their apps to increase their addictiveness (LaunchPad, 2020), so the concerns of mobile phone and social media addiction for the youth is urgent now more than ever. Actor-Network Theory captures the nature of the codependence between adolescents overusing their phones and social media companies needing more engagement to profit. However, this theory fails to account for the larger-scale picture of how this relationship came to be, as well as how to change the relationship in the future, which other ethical frameworks like Social Construction of Technology (Bijker, 2015) would better account for.

Psychology and Susceptibility of Addiction

The psychological explanation for why humans have become so dependent on mobile phones and social media is quite simple. There is a chemical in our brains called dopamine, that gives feelings of pleasure, satisfaction, and motivation when it is released (HealthDirect, 2023). Evolutionists believe dopamine was incorporated into human biology to function as a reward system. Specifically, it serves as a system that rewards actions that contribute to survival: eating, drinking, and competing to survive and reproduce (Cleveland Clinic, 2022). For practically all of human history, dopamine has kept our species alive and well. However, the dopamine reward system may be serving more as punishment in the 21st century amidst the current technological boom occurring. To analyze the role of dopamine on addiction and poor mental health, I will review the findings and claims made in the book *Dopamine Nation: Finding Balance in the Age of Indulgence*, written by Stanford psychiatrist Dr. Anna Lembke (Lembke, 2021).

Before diving into the highlights of Dr. Lembke's book, it is important to note the potential subjectivity embedded in it. *Dopamine Nation* is structured around explaining the

causes, effects and solutions to addiction. The book is filled with scientific experiments that correlate with the claims she makes to back her points. While the experiments are a significant part of the basis of Lembke's claims, she also forms her conclusions from personal and patient anecdotes. Many may argue that anecdotal evidence is unreliable, as it takes a singular story and applies it to a larger population. Despite this, I believe she primarily uses her own qualitative experiences to connect the quantitative studies to her claims. In other words, Lembke uses the previous studies as a base, and uses her own personal experiences with herself and patients as a way to "fill in the gap". Although this implies that there is some speculation in her novel, Lembke's status as a Stanford psychiatrist brings credibility to her assertions.

Dopamine Nation was published in 2021, shedding light on the under-studied issue of "compulsive overconsumption" (Lembke, 2021, p. 8). Compulsive overconsumption is what it sounds like - compulsively consuming stimuli that provide instant gratification. This concept goes hand in hand with addiction. In her book, Lembke defines addiction as "the continued and compulsive consumption of a substance or behavior despite its harm to self and/or others" (Lembke, 2021, p. 8). To explain how addiction causes self harm, Lembke uses the analogy of the pain-pleasure seesaw. Pain and pleasure are chemically produced in overlapping regions of the brain, operating with an "opponent-processing mechanism" (Lembke, 2021, p. 34). This means that pain and pleasure work like a balance, or a seesaw, with pain on one side and pleasure on the other (see the image below).



Like how any balance functions, it wants to remain in equilibrium. Any act of pain or pleasure will result in the scale eventually tipping back the same degree in the opposite direction. For example, someone picks up their phone and opens up Instagram. They scroll around for 5 minutes, enjoying the entertainment the app provides, releasing dopamine, and tipping the seesaw towards the pleasure side. After scrolling, this person puts their phone down, and starts feeling restless and uncomfortable, as the seesaw tips the same magnitude towards the pain side as a dopamine deficit forms. In order to feel comfortable, they pick up their phone again. Large corporations like Microsoft, Apple, and Meta are reliant on this human susceptibility to keep users using their products, and therefore raising profits. The chemical reliance of humans on mobile phones to receive pleasure and the financial reliance of tech companies on humans to use their products shows the strength of the Actor-Network connections between humans and mobile phones.

The relationship between pain and pleasure can be used to explain addiction. In the example provided, in order to avoid the uncomfortable feelings, this person goes back to their phone repetitively, mindlessly scrolling through different apps to avoid that feeling of discomfort. As this pattern repeats itself, users begin to rely on their “drug of choice” not to feel good, but to feel normal (Lembke, 2021, p. 40). In a study conducted on medical students in Central Serbia, significant results all at p-values of 0.005 or lower showed correlation of having

a smartphone addiction with poor sleep quality, elevated stress levels, anxiety, and depression (Nikolic et al., 2023). It is important to note the test subjects of this experiment were medical students. However, I believe the age difference is marginal enough for the results to still be applicable. As previously mentioned, adolescents are believed to be more susceptible to developing addictions than older age groups (Christiansen, 2023). To add on, smartphone ownership in 10-year-olds has more than doubled from 19% to 42% from 2015 to 2021, and increased from 41% to 71% in 12-year-olds (Common Sense, 2021, p. 22). This shows that the dangerous mental health effects of mobile phones and social media are skyrocketing in prevalence within the past decade.

Addiction Prevention and Treatment

The question of who should be and who will be responsible for dealing with mobile phone and social media addiction yields different answers. From an ethical standpoint, it would seem that corporations have a responsibility to the public to mitigate the risk of addiction in the development of their products. However, this view has been widely ignored. Our attention has become the product, and in response, companies increasingly build addiction into the design of social media platforms (LaunchPad, 2020). Like previously stated, this means that applications that are able to retain our screen time the longest get the most revenue, primarily through advertisements. As large tech corporations rely on our attention for profit, it is unrealistic to expect a business model change without legal encouragement.

Government regulation is a slightly more promising avenue. Law professor Kyle Langvardt argues that specific regulation could help discourage production of addictive social

media apps (Gale, 2019), like restricting targeted advertisements or setting revenue caps from advertisements. Although he believes the case could be made, Langvardt worries that his proposal would be met with First Amendment claims, as social media is understood in the judicial system as a form of “protected expression” (Gale, 2019). However, it appears that as of 2024, the U.S. has been taking Langvardt’s advice. In just the past month, California school districts, New York’s Department of Education, New Mexico’s attorney general, and even Facebook’s own shareholders have filed lawsuits against social media companies for various concerns over adolescents using these applications (Miller, 2024). Back-and-forths are currently occurring in these cases, with no hard court rulings yet, supporting Langvardt’s concerns, but it can be seen that this issue is gaining legal momentum. However, even if government regulation were to pass, the issue of mobile phone addictions would only be fractionally dampened as there are almost limitless avenues to foster addictive relationships with mobile phones, creating a need for a different approach to protect adolescents.

This brings us to the only current feasible solution to preventing adolescent mobile phone and social media addiction: individual measures. Dr. Lembke goes over several individual-based strategies to help regain control over addiction, but predominantly discusses the concept of mindfulness. When practicing mindfulness, one focuses on observing their own thoughts without any self-judgment (Lembke, 2021, p. 61). This practice is crucial in allowing oneself to become comfortable in the absence of the “drug of choice”, which in this case is mobile phones and social media. Through mindfulness, adolescents struggling with mobile phone and social media usage can become more aware of how the usage affects them, leading to healthier habit development. The broader scope of general addiction resolution Lembke discusses does not cater

exactly to mobile phones and social media. However, extensive literature review has supported her methods as effective approaches.

Lembke discusses other approaches to combating addiction as well. Dopamine fasting or detoxing is also a popular method that would involve the user completely abstaining from use (Lembke, 2021, p. 57). This could be applied by uninstalling all or specific social media applications that dominate screen time. This approach is on the extreme end, and can be very difficult to follow. To add on, Lembke noted from her psychiatric experience that dopamine fasting proved ineffective for roughly 20% of patients. However, this approach is often the best solution in extreme addiction cases. Dopamine fasting is a type of self-binding, which Lembke defines as intentionally creating barriers between ourselves and our “drug of choice” (Lembke, 2021, p. 68). Some other forms of self-binding to limit mobile phone and social media usage could be the following: setting screen time limits, keeping your phone out-of-reach for extended periods of time, and disabling social media notifications. Everyone is different, and thus there is no “right answer” for how to combat unhealthy mobile phone and social media addictions. The important takeaway should be that there are individual measures to be taken to help rehabilitate and prevent these addictions, and the only way to find out what works for each individual is through diligent experimentation.

Conclusion

Mobile phones and social media are becoming more ingrained into the lives of all, taking deeper roots especially in adolescents. Over recent years, adolescents have been getting mobile phones and social media accounts earlier and spending more time on their screens. The nature of

competition in a capitalistic economy has caused super-tech companies like Apple, Microsoft, and Meta to design their mobile phones and social media applications to be heavily addictive, competing to maximize user time spent using their products. Features such as infinite scrolling, increased notifications, and algorithms designed to provide content catered to users based on personal data are a few of the ways these companies have built addiction into the design of social media applications. In a time of precious neurological development among adolescents, harmful formations of dependence take hold more easily than for older age groups.

Legal battles are presently ensuing against social media companies specifically for the poor psychological consequences inflicted on adolescents. In the meantime, the best way to harness a healthy relationship with our handheld technology comes individually. Practices of mindfulness is a highly-recommended, powerful method of fighting addiction. Other methods of self-binding, specifically dopamine fasting, are other methods to cope with addiction. Generally, a mix of different techniques is likely to work best, and determining that combination comes from individual experimentation. In the future, there is likely to be a shift in regulations behind mobile phone and social media design. However, the technological boom we are living in is likely about to be further spurred by the advancement of artificial intelligence. With the uncertainty of how our future will pan out technologically, it is more important than ever to develop the foundations to maintain healthy mental health and relationships with ourselves and the technology we are and will be surrounded by.

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