

MANIPULATING MINORS: HOW SOCIAL MEDIA HIJACKS DOPAMINE PATHWAYS IN CHILDREN

Meghan Harrison

I. INTRODUCTION

Social media dramatically changed the world. In 2000, the interconnected world was a far-off dream. Since then, society has rushed to adopt new technology with little consideration to potential harms. Teens spend hours on social media; their smartphones are essentially an extra limb. As social media usage has increased, so have mental health issues.¹ Teen girls that spend more than five hours per day on social media have a 66% increase in the risk for suicide-related outcomes than peers spending only one hour on social media.² For each hour spent on social media, depressive symptoms increase.³ Active social media users' biological and psychological symptoms are similar to drug and alcohol addicts.⁴

Social media was designed to hold users' attention and keep them scrolling.⁵ As the architects of social media platforms, coders do an exceptional job of capturing users' attention. They tap into the

¹ Anya Kamenetz, *It's a Smartphone Life: More than Half of U.S. Children Now Have One*, NPR (Oct. 31, 2019, 12:05 PM), <https://www.npr.org/2019/10/31/774838891/its-a-smartphone-life-more-than-half-of-u-s-children-now-have-one>; *Cell Phone Ownership*, PEW RES. CTR. (Mar. 19, 2012), <https://www.pewresearch.org/internet/2012/03/19/cell-phone-ownership/>; *Ledger of Harms*, CTR. FOR HUMANE TECHNOLOGY, https://ledger.humanetech.com/#study_30 (last updated June 2021) (citing Jean M. Twenge et al., *Increases in Depressive Symptoms, Suicide-Related Outcomes, and Suicide Rates Among U.S. Adolescents After 2010 and Links to Increased New Media Screen Time*, CLINICAL PSYCHOLOGICAL SCI. (2018)).

² *Ledger of Harms*, CTR. FOR HUMANE TECHNOLOGY, https://ledger.humanetech.com/#study_24 (last updated June 2021) (citing Jean M. Twenge et al., *Increases in Depressive Symptoms, Suicide-Related Outcomes, and Suicide Rates Among U.S. Adolescents After 2010 and Links to Increased New Media Screen Time*, CLINICAL PSYCHOLOGICAL SCI. (2018)).

³ See CTR. FOR HUMANE TECHNOLOGY, https://ledger.humanetech.com/#study_26 (last updated June 2021) (citing Elroy Boers et al., *Association of Screen Time and Depression in Adolescence*, 173 JAMA PEDIATRICS 853 (2019)).

⁴ See Huseyin B. Macit et al., *A Research on Social Media Addiction and Dopamine Driven Feedback*, 5 J. OF MEHMET AKIF ERSOY U. ECON. AND ADMIN. SCI. FAC. 832, 833 (2018).

⁵ *Pathways: How Digital Design Puts Children at Risk*, 5RIGHTS FOUNDATION 1, 7 (2021), <https://5rightsfoundation.com/uploads/Pathways-how-digital-design-puts-children-at-risk.pdf>.

brain's dopamine pathways through behavioral science.⁶ Social media platforms are designed to make the experience seamless.⁷

This paper explores social media's power to persuade, its ability to release dopamine, and its harms to children. First, the paper briefly discusses how algorithms work and their complexity. Second, it delves into persuasive technology, understanding what it is and how it works, as well as the motivations of the coders designing the platforms. Third, the paper explains dopamine's role in the brain, why it is associated with addictions, how social media releases it, and the vulnerability of adolescents due to their rapid brain development. Fourth, concerns about social media from parents, legislators, and high-ranking or former digital company employees are discussed. Fifth, future recommendations are given to help social media companies gain back trust and to help consumers avoid the harms.

II. THE MECHANICS: HOW ALGORITHMS WORK

Algorithms are a set of step-by-step instructions to solve a problem.⁸ A coder creates an algorithm to solve a specific problem and a computer executes the program. Algorithms can be as simple as the "COUNTIF" formula in Excel, searching for a specific criterion in a set range, or as complicated as a neural network mimicking the human brain.⁹

"A neural network attempts to mimic the way a human brain approaches problems and uses layers of interconnected units to learn and infer relationships based on observed data."¹⁰ As data changes, these networks learn from it and adjust.¹¹

Social media algorithms are the complicated kind.¹² The algorithms use data gathered from users' interactions to tailor content toward specific users.¹³ Posts are prioritized depending on the likelihood the user will want to see it.¹⁴ These types of

⁶ *Pathways: How Digital Design Puts Children at Risk*, *supra* note 5, at 26.

⁷ *See id.*

⁸ Judith Hurwitz & Daniel Kirsch, MACHINE LEARNING FOR DUMMIES 28 (Carrie A. Burchfield et al. eds., IBM Limited ed. 2018).

⁹ *See id.* at 31.

¹⁰ Judith Hurwitz & Daniel Kirsch, *supra* note 8, at 31.

¹¹ *Id.*

¹² Social media is "any website or application that enables users to engage in social networking activities such as creating, sharing or interacting with information." Tahir M. Nisar et al., *Social Media Information Benefits, Knowledge Management and Smart Organizations*, 94 J. OF BUS. RES., 264, 265 (2019).

¹³ Taina Bucher, *The Right-Time Web: Theorizing the Kairologic of Algorithmic Media*, 22(9) NEW MEDIA & SOC'Y, 1699 (2020), <https://journals.sagepub.com/doi/full/10.1177/1461444820913560>.

¹⁴ *Id.* at 1700.

algorithms determine the posts users see on Facebook, the suggested content on Netflix, and TikTok’s curated “For You” page.

People are heavily influenced by others.¹⁵ Algorithms are beginning to fill that influential role in places where human preferences are a source of business.¹⁶ Algorithms help save time and have made the world more efficient. However, there is a dark side that is overlooked when new technologies are being released. The impact of algorithmic decisions on what users want to see can breed depression, anxiety, staunch political ideologies, and more.¹⁷ Like cigarettes, which were all the rage in the past before the cancerous effects were discovered, social media is also heavily used. It is critical to study its impact on people – especially children.

III. PERSUASIVE TECHNOLOGY

a. WHAT IS PERSUASIVE TECHNOLOGY?

Persuasive technology is “created specifically to change its users’ opinions, attitudes, or behaviors to meet its goals.”¹⁸ When designing social media platforms, digital companies consider people’s motivations, their ability to access content, and triggers to keep users coming back.¹⁹ The more data a digital company collects, the more persuasive they can be. Data helps them find the right method to hook users in.²⁰

Stanford professor B.J. Fogg, Ph.D. is the father of persuasive technology and the founder and director of Stanford’s Persuasive Technology Lab, now renamed the Behavior Design Lab.²¹ He developed the study of “captology,” which focuses on

¹⁵ Devyn Hinkle, *How Streaming Services Use Algorithms*, ARTS MGMT. & TECHNOLOGY LABORATORY, (Aug. 18, 2021), <https://amt-lab.org/blog/2021/8/algorithms-in-streaming-services>.

¹⁶ *Id.*

¹⁷ Tammy Qiu, *A Psychiatrist’s Perspective on Social Media Algorithms and Mental Health*, STAN. U.: HUMAN-CENTERED ARTIFICIAL INTELLIGENCE (Sept. 14, 2021), <https://hai.stanford.edu/news/psychiatrists-perspective-social-media-algorithms-and-mental-health>; see *Ledger of Harms*, CTR. FOR HUMANE TECHNOLOGY, <https://ledger.humanetech.com/> (last updated June 2021).

¹⁸ *Persuasive Technology: How Does Technology Use Design to Influence my Behavior?*, CTR FOR HUMANE TECHNOLOGY, <https://www.humanetech.com/youth/persuasive-technology> (last updated Aug. 17, 2021).

¹⁹ *Id.*

²⁰ *Id.*

²¹ *BJ Fogg*, STAN. BEHAV. DESIGN LAB: MODELS AND METHOD FOR BEHAV. CHANGE, <https://behaviordesign.stanford.edu/people/bj-fogg> (last visited Apr. 20, 2022); see *Persuasion Through Mobile Devices and Operant Conditioning via Interactive Technology*, STAN. U: MEDIA X, <https://mediax.stanford.edu/research-projects/scs-fogg/> (last visited Apr. 26, 2022).

computers as persuasive technologies.²² Some of his former students have worked at Instagram and Google.²³

In its best form, persuasive technology can be used for good – to learn a language, to do physical therapy at home, or to meditate. Despite the benefits, Dr. Fogg has long warned that “persuasive technologies can also serve ignoble purposes.”²⁴ He has continually discussed the ethical implications of these technologies and even warned the Federal Trade Commission in 2006 of the issues persuasive technology could pose.²⁵

When digital platforms are offered to users for free, the user becomes the product.²⁶ Digital companies depend on advertising revenue.²⁷ Users are the product that digital companies peddle to advertisers. In these situations, companies are less likely to protect the user and more likely to exploit their vulnerabilities.

To keep users scrolling, coders make intentional decisions about when digital platforms show notifications, withhold likes, and suggest videos and articles.²⁸ Persuasive technology harnesses psychology and behavioral science to capture users’ attention.²⁹

Unlike radio and television, the digital world is interactive. “Persuasion techniques are most effective when they are interactive, when persuaders adjust their influence tactics as the situation evolves.”³⁰ Skilled salespeople tailor their pitch to consumers’ needs, wants, and motivations.³¹ However, they have limited information. Digital companies, on the other hand, are collecting mountains of data on their users.³² The systems they have set up use

²² BJ Fogg, *Persuasive Technologies*, 42 COMMUNICATIONS OF THE ACM 26 (1999), <https://cacm.acm.org/magazines/1999/5/7910-persuasive-technologies/fulltext>.

²³ Yasmin Samraï, *How Stanford Profits Off Addiction*, THE STAN. REV. (Feb. 4, 2020), <https://stanfordreview.org/how-stanford-profits-tech-addiction-social-media/>.

²⁴ BJ Fogg, *Persuasive Computers: Perspectives and Research Directions*, CHI '98: PROC. OF THE SIGCHI CONF. ON HUM. FACTORS IN COMPUTING SYSTEMS 225, 229 (1998).

²⁵ BJ Fogg, *The Facts: BJ Fogg & Persuasive Technology*, MEDIUM (Mar. 18, 2018), <https://medium.com/@bjfogg/the-facts-bj-fogg-persuasive-technology-37d00a738bd1>.

²⁶ *Persuasive Technology: How Does Technology Use Design to Influence my Behavior?*, *supra* note 18.

²⁷ *Pathways: How Digital Design Puts Children at Risk*, *supra* note 5, at 24.

²⁸ *Pathways: How Digital Design Puts Children at Risk*, *supra* note 5.

²⁹ *See id.*

³⁰ BJ Fogg, *PERSUASIVE TECHNOLOGY: USING COMPUTERS TO CHANGE WHAT WE THINK AND DO* 6 (2003).

³¹ *Id.*

³² *See* Brian X. Chen, *The Battle for Digital Privacy is Reshaping the Internet*, N.Y. TIMES (Sept. 21, 2021), <https://www.nytimes.com/2021/09/16/technology/digital-privacy.html>.

the data (regarding demographics, likes, dislikes, health, habits, and politics) to tailor content to keep users engaged.³³

Artificial Intelligence drives social media companies; each personalized newsfeed, video suggestion, and notification is persuasive technology. TikTok became popular because its algorithms are incredibly persuasive.³⁴ These digital companies essentially have persuasion profiles that know what persuasion strategies work for each user.³⁵ Unlike traditional media, it is less clear on digital platforms when a user is being persuaded.

b. CODERS' GOALS

Coders are the architects of persuasive algorithms. Each choice they make affects the platform and its users. It is important to understand the motivations behind their decisions. Coders at digital companies are driven to compete.³⁶ Like a horse with blinders, “[i]f a senior person gives a directive, say[ing] increase reach, then that’s what [coders] design for without necessarily thinking about the consequences of doing that.”³⁷ There are three goals coders focus on: maximizing time spent on the platform, maximizing reach of the platform, and maximizing activity and interactions on the platform.³⁸ Financial success is at the heart of these goals – the more users on the social media platform, the more product the company sells to advertisers. More advertisers equals more company profit. “The digital landscape, then, has become situated in an ‘economy’ where time and attention are the currencies.”³⁹

To draw users in, coders have created push notifications and endless scrolling feeds. They “tap into a user’s underlying motivations, make the experience as seamless as possible and provide regular prompts or triggers to build . . . habits.”⁴⁰ Persuading and shaping users’ preferences is accomplished through content delivery, the limitations built into the platform’s architecture, the

³³ BJ Fogg, *supra* note 30.

³⁴ *Persuasive Technology: How Does Technology Use Design to Influence my Behavior?*, *supra* note 18.

³⁵ BJ Fogg, *BJ-Fogg-FTC-Fall2006*, VIMEO, <https://vimeo.com/117427520> (last viewed Apr. 14, 2022).

³⁶ *Pathways: How Digital Design Puts Children at Risk*, *supra* note 5, at 28.

³⁷ *Id.*

³⁸ *Id.* at 7.

³⁹ Devangi Vivrekar, *Persuasive Design Techniques in the Attention Economy: User Awareness, Theory, and Ethics* 6 (June 6, 2018) (unpublished Master’s thesis, Stanford University) (on file with the Stanford Digital Repository).

⁴⁰ *Pathways: How Digital Design Puts Children at Risk*, *supra* note 5, at 26.

wording used, the colors and aesthetic look, and the rules behind what content is viewed by each user.⁴¹

Coders want to “engage users by making content more and more appealing, and reducing friction in consumption.”⁴² Friction in a design is “anything that requires the user to work by clicking, tapping or having to think harder.”⁴³ A frictionless design removes the work.⁴⁴ Human users put in very little effort and are on the sidelines as passive consumers. “Humans take the path of least resistance by default, so [coders] can guide user behaviour by making an experience easier, more frictionless.”⁴⁵

Instantaneous communication is a blessing and a curse. Connecting with others has never been as fast. News, messages, and comments can be shared globally in seconds. However, this benefit comes at a cost; social media companies treat human users as resources that have extractable value.

IV. DOPAMINE

Digital companies know what persuasion strategies keep users scrolling, clicking, and engaging on their platforms. Why should users care? Chamath Palihapitiya, the former Vice President of User Growth at Facebook said, “I feel tremendous guilt The short-term, dopamine-driven feedback loops that we have created are destroying how society works.”⁴⁶ Facebook’s first president Sean Parker noted, “The thought process that went into building these applications . . . was all about: ‘How do we consume as much of your time and conscious attention as possible?’ It’s a social-validation feedback loop...you’re exploiting a vulnerability in human psychology.”⁴⁷ Parker added, “The inventors . . . understood this consciously. And we did it anyway.”⁴⁸ Exploiting human vulnerabilities is an ethical issue.

⁴¹ *Pathways: How Digital Design Puts Children at Risk*, *supra* note 5, at 25-26.

⁴² *Id.* at 22.

⁴³ *Id.* at 27.

⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ Stanford Graduate School of Business, *Founder and CEO Social Capital, on Money as an Instrument of Change*, YOUTUBE (Nov. 13, 2017), <https://youtu.be/PMotykw0SIk>.

⁴⁷ Mike Allen, *Sean Parker Unloads on Facebook: “God Only Knows What it’s Doing to our Children’s Brains”*, AXIOS (Nov. 9, 2017), <https://www.axios.com/sean-parker-unloads-on-facebook-god-only-knows-what-its-doing-to-our-childrens-brains-1513306792-f855e7b4-4e99-4d60-8d51-2775559c2671.html>.

⁴⁸ *Id.*

a. UNDERSTANDING DOPAMINE

When digital companies use persuasive technology to harness behavioral science, they tap into the brains' dopamine pathways. "Dopamine is [a] reward neurotransmitter, and . . . the main chemical involved in addiction."⁴⁹ In natural amounts, its release rewards humans for beneficial behaviors and motivates repetition of those behaviors.⁵⁰ Dopamine is released when people eat delicious food, exercise, or have good social interactions.⁵¹

There are three dopamine "reward pathways" in the brain.⁵² They are activated both when experiencing or anticipating a reward.⁵³ When dopamine is released, whether it is from food or an illegal drug, the levels reach a peak, and then they drop.⁵⁴ Instead of dropping back to the individual's baseline level, the level dips below it.⁵⁵ "This transient dopamine mini-deficit state is what motivates us to seek out reward."⁵⁶ The deficit causes cravings and the need for more dopamine. "Repeated exposure to the same or similar stimuli ultimately creates a chronic dopamine-deficit state, wherein we're less able to experience pleasure."⁵⁷

b. ADDICTION RESETS DOPAMINE PATHWAYS

"[A]ddiction involves a hijacking of the brain's circuitry, a reprogramming of the reward system, and lasting, sometimes permanent, brain changes."⁵⁸ It is a "compulsive consumption of a substance or behavior" even if it causes harm.⁵⁹ "Dopamine is used to measure the addictive potential of any behavior or drug."⁶⁰ The more dopamine released "and the faster it is release[d], the more

⁴⁹ Dr. Anna Lembke, *The Smartphone has become the Modern-Day Hypodermic Needle*, THE JOURNAL (Oct. 14, 2021, 7:01 AM), <https://www.thejournal.ie/prev/5569503/dv6GLpo.A7QNY/>.

⁵⁰ Trevor Haynes, *Dopamine, Smartphones & You: A Battle for your Time*, HARV. GRADUATE SCH. OF THE ARTS AND SCI.: SCI. IN THE NEWS (May 1, 2018), <https://sitn.hms.harvard.edu/flash/2018/dopamine-smartphones-battle-time/#>.

⁵¹ *Id.*

⁵² *Id.*

⁵³ *Id.*

⁵⁴ Anna Lembke, DOPAMINE NATION: FINDING BALANCE IN THE AGE OF INDULGENCE 50-60 (2021).

⁵⁵ *Id.*

⁵⁶ Anna Lembke, *supra* note 54, at 59.

⁵⁷ Bruce Goldman, *Addictive Potential of Social Media, Explained*, STANFORD MEDICINE: SCOPE BLOG (Oct. 29, 2021), <https://scopeblog.stanford.edu/2021/10/29/addictive-potential-of-social-media-explained/#:~:text=The%20brain%20responds%20to%20this,less%20able%20to%20experience%20pleasure>.

⁵⁸ Cynthia M. Kuhn & Wilkie A. Wilson, *How Addiction Hijacks Out Rewards System*, CEREBRUM: THE DANA F. ON BRAIN SCI. (Apr. 1 2005), <https://dana.org/article/how-addiction-hijacks-our-reward-system/>.

⁵⁹ Anna Lembke, *supra* note 54, at 16.

⁶⁰ *Id.* at 49.

addictive the drug.”⁶¹ Human bodies self-regulate to maintain equilibrium.⁶² The same pathways in the body that regulate reward overlap with areas regulating pain.⁶³ Reward and pain are balanced like a seesaw.⁶⁴ Dopamine is released and the balance tilts toward reward.⁶⁵ Self-regulating mechanisms restore equilibrium, but then the balance tips “an equal and opposite amount to the side of pain.”⁶⁶ This is why people have hangovers and “after-reactions.”⁶⁷

In heavy, prolonged use of high-dopamine substances, users end up with a dopamine deficit.⁶⁸ Their bodies decrease dopamine receptors and the release of dopamine.⁶⁹ Natural rewards stop being pleasurable because of this decreased sensitivity.⁷⁰

c. SOCIAL MEDIA RELEASES DOPAMINE IN THE BRAIN

“Although not as intense as a hit of cocaine, positive social stimuli will similarly result in a release of dopamine.”⁷¹ Social media platforms offer a constant and unlimited supply of social stimuli.⁷² “Every spare second is an opportunity to be stimulated.”⁷³ Notifications, likes, and personalized content all activate the dopamine pathways in the brain.⁷⁴

TikTok specifically tailors personalized videos for each user.⁷⁵ Personalization factors include how long and how many times a user watched a video, what videos users liked or shared, accounts users follow, the user’s content and comments on posts, the interest categories chosen when the user signed up for TikTok,

⁶¹ Anna Lembke, *supra* note 54, at 49.

⁶² *Id.* at 51.

⁶³ *Id.* at 50.

⁶⁴ *Id.*

⁶⁵ *Id.* at 51.

⁶⁶ *Id.* at 52.

⁶⁷ *Id.*

⁶⁸ Anna Lembke, *supra* note 54, at 54-55.

⁶⁹ *Id.* at 56.

⁷⁰ *Id.*

⁷¹ Trevor Haynes, *supra* note 50.

⁷² *Id.*

⁷³ Jamie Waters, *Constant Craving: How Digital Media Turned Us All Into Dopamine Addicts*, THE GUARDIAN, (Aug. 22, 2021), <https://www.theguardian.com/global/2021/aug/22/how-digital-media-turned-us-all-into-dopamine-addicts-and-what-we-can-do-to-break-the-cycle>.

⁷⁴ Julie Jargon, *TikTok Brain Explained: Why Some Kids Seem Hooked on Social Video Feeds*, WALL ST. J. (Apr. 2, 2022, 9:00 AM), <https://www.wsj.com/articles/tiktok-brain-explained-why-some-kids-seem-hooked-on-social-video-feeds-11648866192?page=1>; *Social Media and the Brain: Why is Persuasive Technology so Hard to Resist?*, CTR. FOR HUMAN TECHNOLOGY, <https://www.humanetech.com/youth/social-media-and-the-brain> (last updated Aug. 17, 2021).

⁷⁵ *Pathways: How Digital Design Puts Children at Risk*, *supra* note 5, at 30.

⁷⁵ *Id.*

a user choosing “not interested,” the language preference, the user’s country, and the type of device being used.⁷⁶ Greater weight is given to certain factors and “[c]ontent is continually refined more and more towards what [the user is] most likely to engage with, amplifying what captures [the user’s] attention the most.”⁷⁷ Originally the maximum length of a TikTok video was sixty-seconds, then it was changed to three minutes, and now, TikTok users can post ten-minute videos.⁷⁸

A recent study in China looked at TikTok and brain activation.⁷⁹ Two different dopamine areas were activated. Personalized videos tailored to the user activated one pathway, and short videos, regardless of personalization, activated the other.⁸⁰ While TikTok has been increasing the maximum video length, competitors like Instagram, Snapchat, and YouTube have been “chasing shorter videos” capped at one minute.⁸¹ “Nearly 50 percent of users surveyed by TikTok said videos longer than a minute long were stressful; a third of users watched videos online at double speed.”⁸² Platform design affects users.

More studies need to be conducted on how much dopamine is being released by these social media interactions. However, it is clear social media platforms can more consistently release dopamine in the brain than natural, nondigital interactions.⁸³ “The results of neurological and psychiatric tests on social media users show that similar biological and psychological symptoms of alcohol, cigarette and drug addicts are seen in active social media users.”⁸⁴

Digital companies “deliberately leverage our deepest vulnerabilities by promoting compulsive behavior that compromises our autonomy and well-being.”⁸⁵ To do this, they (1) make the trivial seem urgent, (2) encourage users to keep seeking dopamine, (3) force users to multitask, (4) weaponize fear and anxiety, (5)

⁷⁶ *Pathways: How Digital Design Puts Children at Risk*, *supra* note 5, at 30.

⁷⁷ *Id.*

⁷⁸ Julie Jargon, *supra* note 74.

⁷⁹ Conghui Su et al., *Viewing Personalized Video Clips Recommended by TikTok Activates Default Mode Network and Ventral Tegmental Area*, 237 *NEUROIMAGE* 9 (2021).

⁸⁰ *Id.* at 4-9.

⁸¹ Chris Stokel-Walker, *TikTok Wants Longer Videos – Whether You Like it or Not*, *WIRED* (Feb. 21, 2022, 7:00 AM), <https://www.wired.com/story/tiktok-wants-longer-videos-like-not/>.

⁸² Chris Stokel-Walker, *supra* note 81.

⁸³ *See* Dr. Anna Lembke, *supra* note 49.

⁸⁴ Huseyin B. Macit et al., *supra* note 4.

⁸⁵ *How Social Media Hacks Our Brains*, *CTR. FOR HUMANE TECHNOLOGY*, <https://www.humanetech.com/brain-science> (last visited Mar. 25, 2022).

encourage constant social comparison, and (6) tell users what they want to hear.⁸⁶

First, human attention is limited, which makes it a valuable resource.⁸⁷ Digital companies have seconds to capture users' attention. In a world of endless stimuli, the brain categorizes important and unimportant information.⁸⁸ To prod users to focus on social media, digital companies make the trivial, like Facebook or TikTok notifications, seem urgent.⁸⁹ The use of red dots, vibrations, and other notification techniques trigger the brain to release dopamine and believe there is an important opportunity or a threat.⁹⁰

Second, social media is designed to encourage users to seek dopamine.⁹¹ Social media releases dopamine, but after the spike, dopamine levels fall below the user's normal baseline.⁹² The user craves more dopamine.⁹³ This leads to endless scrolling and mindless consumption to receive dopamine. Social media engagement and time spent on the digital platforms rise.

A third way social media hijacks the brain is through multitasking.⁹⁴ Social media users quickly switch between posts, videos, and comments. "Multitasking creates a dopamine-addiction feedback loop, effectively rewarding the brain for losing focus and for constantly searching for external stimulation."⁹⁵ The National Academy of Sciences stated that "media multitasking among youth is associated with poorer memory, increased impulsivity, and changes in brain function."⁹⁶

Fourth, social media companies weaponize fear and anxiety.⁹⁷ Human brains process negative information faster than positive.⁹⁸ From an evolutionary perspective, it was more important for humans to process a crouching lion lying in wait than to process

⁸⁶ *How Social Media Hacks Our Brains*, *supra* note 85.

⁸⁷ *Id.*

⁸⁸ *Id.*

⁸⁹ *Id.*

⁹⁰ *Id.*; see Adhe Siska, *Why I Can't Stop Scrolling My Social Media?*, THE U. OF MELBOURNE (Sep. 28, 2020), <https://blogs.unimelb.edu.au/sciencecommunication/2020/09/28/why-i-cant-stop-scrolling-my-social-media/>.

⁹¹ See *How Social Media Hacks Our Brains*, *supra* note 85; see Trevor Haynes, *supra* note 50.

⁹² Anna Lembke, *supra* note 47.

⁹³ *Id.*

⁹⁴ *How Social Media Hacks Our Brains*, *supra* note 85.

⁹⁵ Daniel J. Levitin, *Why the Modern World is Bad for Your Brain*, THE GUARDIAN (Jan. 18, 2015), <https://www.theguardian.com/science/2015/jan/18/modern-world-bad-for-brain-daniel-j-levitin-organized-mind-information-overload>.

⁹⁶ *How Social Media Hacks Our Brains*, *supra* note 85.

⁹⁷ *Id.*

⁹⁸ *Id.*

a beautiful flower. “[S]ocial media content generating fear, anger, and disgust spreads much faster than positive content.”⁹⁹

Fifth, social media encourages constant social comparison.¹⁰⁰ Comparison can push humans to grow and be better; however, it can also lead to emotions like “envy, shame, anxiety, or conceit.”¹⁰¹ Social media floods newsfeeds with perfect images of idealized life. The small snapshots of perfection ignore the messy, real-life moments. “Influencers establish standards of excellence and we tether our self-image to those ideals.”¹⁰² Likes on posts are rewarding users with dopamine and lead them to curate their content to what their followers desire to see. Users are continually comparing themselves to more followed users or more “liked” content. “This is a recipe for compulsive comparison, self-doubt, and egocentric melodrama.”¹⁰³

Sixth, digital companies know users’ preferences and create online echo chambers.¹⁰⁴ This can lead to polarization and people believing completely “different versions of reality.”¹⁰⁵ A study of YouTube from 2020 found that the website “rarely suggests videos that might feature conspiracy theories, extreme bigotry or quack science to people who have shown little interest in such material.”¹⁰⁶ The video recommendations confirm people’s narratives. Exposure to fake news “can increase later belief in that headline . . . scrolling through social media feeds laden with emotionally provocative content has the power to change the way we see the world and make political decisions.”¹⁰⁷ When the brain encounters novel information, dopamine increases.¹⁰⁸ “[E]motionally provocative information stands a stronger chance of lingering in our minds and being incorporated into long-term memory banks.”¹⁰⁹ Instead of

⁹⁹ *How Social Media Hacks Our Brains*, *supra* note 85.

¹⁰⁰ *Id.*

¹⁰¹ *Id.*

¹⁰² *Id.*

¹⁰³ *Id.*

¹⁰⁴ *Id.*

¹⁰⁵ *Id.*

¹⁰⁶ Shira Ovide, *The YouTube Rabbit Hole is Nuanced*, N.Y. TIMES (Apr. 21 2022), <https://www.nytimes.com/2022/04/21/technology/youtube-rabbit-hole.html>.

¹⁰⁷ Rachel A. Barr, *Galaxy Brain: The Neuroscience of How Fake News Grabs Our Attention, Produces False Memories, and Appeals to Our Emotions*, NiemanLab (Nov. 21, 2019, 11:17 AM), <https://www.niemanlab.org/2019/11/galaxy-brain-the-neuroscience-of-how-fake-news-grabs-our-attention-produces-false-memories-and-appeals-to-our-emotions/>.

¹⁰⁸ *Id.*

¹⁰⁹ *Id.*

showing users differing views, social media encourages people to become more entrenched in their ideology.

Yet, according to *Scientific American*, the echo chambers are not the main issue. “[B]iased influencers have a disproportionate impact on their community – enabling small rumors and suppositions to become amplified into widespread misconceptions and false beliefs.”¹¹⁰ They conclude it is the influencers, not the echo chambers, causing issues.

Digital companies use these six vulnerabilities to keep users on their platforms. Unethical use can look like “[u]ser interactions with the product morph[ing] into data collection, manipulative product pushing, and fostering a dependency that is closer to drug addiction than to healthy business practices.”¹¹¹ Digital businesses exploit users when they value their profits above all else. When this occurs, users become marionette dolls and businesses manipulate their strings.

d. CHILDREN ARE ESPECIALLY VULNERABLE

*“I’m fighting against an unseen enemy, which are people on the other side of the screen that are putting videos out there and [my daughter’s] reading these comments that people are posting.”*¹¹² While speaking with a senior clinical psychologist at the Child Mind Institute, Nate Burleson, co-host of “CBS Mornings,” discussed social media causing his daughter to question her beauty and worth.

American youth spend between five to seven-and-a-half hours per day on media-related activities.¹¹³ For “digital natives,” their world is “media-saturated” with smart devices like phones and tablets giving them instantaneous online access.¹¹⁴ They are constantly connected, and their phone is an integral part of their social life. “This is where they monitor their peer status, check

¹¹⁰ Damon Centola, Why Social Media Makes Us More Polarized and How to Fix It, *Scientific American* (Oct. 15, 2020), <https://www.scientificamerican.com/article/why-social-media-makes-us-more-polarized-and-how-to-fix-it/>.

¹¹¹ Rick Mess, *Business Goals vs. User Goals: Striking a Balance*, OUTCROWD: BLOG (Dec. 24, 2021), <https://www.outcrowd.io/blog/business-goals-vs-user-goals-striking-a-balance>.

¹¹² CBS Mornings, *Social Media and Its Effects on Youth Development and Mental Health*, YOUTUBE (Oct. 14, 2021), <https://www.youtube.com/watch?v=xvmeizvQILc>.

¹¹³ Sarah Darmanjian, *Kids, Teens, and Social Media*, NEWS10 ABC (Nov. 1, 2021, 4:32 PM), <https://www.news10.com/news/kids-teens-and-social-media/>.

¹¹⁴ A digital native is someone who grew up with smart devices and does “not remember a time before the internet.” Eveline A. Crone & Elly A. Konijn, *Media Use and Brain Development During Adolescence*, 9 NATURE COMM. 1 (2018), <https://www.nature.com/articles/s41467-018-03126-x.pdf>.

peers' feedback, rejection and acceptance messages, and encounter peers as (idealized) images on screens.”¹¹⁵

“Starting around age 10, children’s brains undergo a fundamental shift that spurs them to seek social rewards, including attention and approval from their peers.”¹¹⁶ Adolescent brains are mainly doing two things.¹¹⁷ First, “white matter connections increase, allowing for more successful communication between different areas of the brain.”¹¹⁸ Second, synaptic pruning occurs, which allows teens and young adults to specialize and find their passion by using what interests them and losing the information that does not.¹¹⁹

“[B]rain regions involved in many social aspects of life are undergoing such extensive changes during adolescence, it is likely that social influences . . . are particularly potent at this age in coalescence with their media use.”¹²⁰ Social media gives users the ability to deliver or withhold social rewards from other users. “Adolescents in particular appear to be guided by their emotions in how they use and process media.”¹²¹ Their emotions can blur the lines of reality.¹²²

During this pivotal time of learning, dopamine levels are high allowing for reinforcement of positive responses.¹²³ Youth are “extra sensitive to attention and admiration from others” due to additional oxytocin and dopamine receptors being created.¹²⁴ These receptors are located in the ventral striatum and receive “a dopamine and oxytocin rush whenever [people] experience social rewards.”¹²⁵ A rush of dopamine “reinforces cravings for something enjoyable, whether it’s a tasty meal, a drug or a funny TikTok video.”¹²⁶

“[A]ll addictive drugs increase the release of dopamine in the brain.”¹²⁷ Addiction is associated with the release of dopamine

¹¹⁵ Eveline A. Crone & Elly A. Konijn, *supra* note 114, at 1.

¹¹⁶ Zara Abrams, *Why Young Brains are Especially Vulnerable to Social Media*, AMERICAN PSYCHOLOGICAL ASSOCIATION (Feb. 3, 2022), <https://www.apa.org/news/apa/2022/social-media-children-teens>.

¹¹⁷ Adolescents are people between the ages of 10-22 years old. Eveline A. Crone & Elly A. Konijn, *supra* note 114.

¹¹⁸ Eveline A. Crone & Elly A. Konijn, *supra* note 114, at 2.

¹¹⁹ *Id.*

¹²⁰ Eveline A. Crone & Elly A. Konijn, *supra* note 114, at 2.

¹²¹ *Id.* at 6.

¹²² *Id.*

¹²³ Dustin Wahlstrom et al., *Developmental Changes in Dopamine Neurotransmission in Adolescence: Behavioral Implications and Issues in Assessment*, 72 BRAIN AND COGNITION 146 (2010).

¹²⁴ Zara Abrams, *supra* note 116.

¹²⁵ *Id.*

¹²⁶ Julie Jargon, *supra* note 74.

¹²⁷ Cynthia M. Kuhn & Wilkie A. Wilson, *supra* note 58.

and reprograms the dopamine reward pathways. “When a person experiences a positive, pleasurable outcome from an action or event, the release of dopamine and other chemicals alters the brain circuitry, providing tools and encouragement to repeat the event.”¹²⁸ The brain is adaptive and over time, as actions are repeated, the brain changes itself. Activities with less dopamine release become less pleasurable and can lead people to focus more on the higher-releasing dopamine activities instead.¹²⁹

TikTok and other social media use the brain circuitry, specifically dopamine bursts, to keep children online and scrolling. As they adapt to the constant flow of content, it’s harder for adolescents’ brains to adapt to slower-moving activities (like reading, homework, or even watching a movie).¹³⁰ In contrast, adults do not rely on peer feedback as much as youth and the area of their brain responsible for regulating “emotional responses to social rewards” is typically more mature.¹³¹

Why is this an issue? The real world moves much slower than the online world. To solve problems or read, children use directed attention.¹³² It “inhibit[s] distractions and sustain[s] attention It requires higher-order skills like planning and prioritizing.”¹³³ Platforms like TikTok do not require directed attention. As children’s brains adapt to the constant flow of content and dopamine release, it is harder for their brains to “adapt to a nondigital activity where things don’t move quite as fast.”¹³⁴

Biochemically, high levels of dopamine can cause anxiety, while low levels can cause depression.¹³⁵ With social media, there is an ever-present dopamine-loop affecting teens. Teens’ brains are not fully developed, and unlike adults, they have less self-control.¹³⁶ Even when they realize a digital platform makes them feel bad, they

¹²⁸ Cynthia M. Kuhn & Wilkie A. Wilson, *supra* note 58.

¹²⁹ See Anna Lembke, *supra* note 54, at 56.

¹³⁰ Julie Jargon, *supra* note 74.

¹³¹ Zara Abrams, *supra* note 116.

¹³² Julie Jargon, *supra* note 74.

¹³³ *Id.*

¹³⁴ *Id.*

¹³⁵ See Anna Lembke, *Digital Addictions are Drowning us in Dopamine*, THE WALL ST. J. (Aug. 31, 2021, 9:32 AM), <https://www.wsj.com/articles/digital-addictions-are-drowning-us-in-dopamine-11628861572>; see *Dopamine Deficiency*, Cleveland Clinic (Mar. 23, 2022), <https://my.clevelandclinic.org/health/articles/22588-dopamine-deficiency>;

¹³⁶ Julia Jargon, *TikTok Brain Explained: Why Some Kids Seem Hooked on Social Video Feeds*, THE WALL ST. J. (Apr. 2, 2022, 9:00 AM), https://www.wsj.com/articles/tiktok-brain-explained-why-some-kids-seem-hooked-on-social-video-feeds-11648866192?mod=Searchresults_pos2&page=1.

lack the self-control to put it down.¹³⁷ Social media’s dopamine-driven feedback loops keep teens scrolling, clicking, and engaging with content.

Despite many families seeing the effects of the digital world on their children, there are only a few studies looking at social media’s effects on the brain.¹³⁸ However, the statistics are concerning.

- For teen girls, those who spend more than five hours per day on social media have a 66% increase in the risk of suicide-related outcomes than their peers that only spend one hour per day on social media.¹³⁹
- Between 2010-2017, depressive symptoms rose 65% for teen girls between 13-18 years old.¹⁴⁰ In 2011, only 23% of teens owned smartphones.¹⁴¹ As of 2019, 84% of teens have smartphones and 53% own smartphones by the time they are 11-years-old.¹⁴²
- “For every hour spent using social media, teens show a 2% increase in depressive symptoms.”¹⁴³
- “Children under age 14 spend nearly twice as long with tech devices (3 hours and 18 minutes per day) as they do in conversation with their families (1 hour and 43 minutes per day).”¹⁴⁴
- Social media has stronger associations with mental health problems than playing video games or watching television.¹⁴⁵ “[H]armful effects usually only becom[e] visible for heavy users (and for moderate users in some

¹³⁷ See Georgia Wells, *Facebook Knows Instagram is Toxic for Teen Girls, Company Documents Show*, THE WALL ST. J. (Sept. 14, 2021, 7:59 AM), https://www.wsj.com/articles/facebook-knows-instagram-is-toxic-for-teen-girls-company-documents-show-11631620739?mod=article_inline.

¹³⁸ Parents have noticed children struggle to read books or sit through movies because those activities are too slow for them. Julia Jargon, *supra* note 136.

¹³⁹ *Ledger of Harms*, *supra* note 2.

¹⁴⁰ *Ledger of Harms*, *supra* note 1.

¹⁴¹ *Cell Phone Ownership*, *supra* note 1.

¹⁴² Anya Kamenetz, *supra* note 1.

¹⁴³ *Ledger of Harms*, *supra* note 3.

¹⁴⁴ *Ledger of Harms*, CTR. FOR HUMANE TECHNOLOGY, https://ledger.humanetech.com/#study_54 (last updated June 2021) (citing Laura Donnelly, *Children Spend Twice As Long on Smartphones as Talking to Parents*, THE TELEGRAPH (Feb. 7, 2019), <https://www.telegraph.co.uk/news/2019/02/07/children-spend-twice-long-smartphones-talking-parents/>).

¹⁴⁵ Jonathan Haidt & Jean Twenge, *Social Media Use and Mental Health: A Review 131-132* (last updated Feb. 25, 2022) (unpublished manuscript, New York University) (Accessed at tinyurl.com/SocialMediaMentalHealthReview).

cases).”¹⁴⁶ “There [was] little evidence of harm for light daily usage.”¹⁴⁷

The Wall Street Journal did an exposé on “The Facebook Files.”¹⁴⁸ The internal documents reveal Facebook’s “own in-depth research shows a significant teen mental-health issue that Facebook plays down in public.”¹⁴⁹ Currently, teens spend more time on Instagram than Facebook.¹⁵⁰ Facebook, Inc., now renamed Meta, is the parent company of Instagram. “[A]bout 22 million teens log onto Instagram in the U.S. each day.”¹⁵¹ In Facebook’s own studies, “[a]mong teens who reported suicidal thoughts, 13% of British users and 6% of American users traced the desire to kill themselves to Instagram.”¹⁵² Many teens “blame Instagram for increases in the rate of anxiety and depression.”¹⁵³ Other than bad press and congressional hearings, there is no recourse for affected teens.

V. WHO IS CONCERNED?

Teachers, parents, and some former tech employees are concerned about social media. Each of the past three years, Congress held hearings about persuasive technology.¹⁵⁴ Five federal bills have been introduced to protect children online.¹⁵⁵

The KIDS Online Safety Act [“the Act”] is the most recent bipartisan bill.¹⁵⁶ The Act was introduced in February 2022 and referred to the Senate Committee on Commerce, Science, and Transportation.¹⁵⁷ Its goal is to provide families “with tools,

¹⁴⁶ Jonathan Haidt & Jean Twenge, *supra* note 145, at 131-132.

¹⁴⁷ *Id.*

¹⁴⁸ The Facebook Files are internal company documents, which include “research reports, online employee discussions and drafts of presentations to senior management.” *The Facebook Files*, THE WALL ST. J., https://www.wsj.com/articles/the-facebook-files-11631713039?mod=series_facebookfiles (last visited Apr. 17, 2022).

¹⁴⁹ Georgia Wells, *supra* note 137.

¹⁵⁰ *Id.*

¹⁵¹ *Id.*

¹⁵² *Id.*

¹⁵³ *Id.*

¹⁵⁴ *For Policymakers*, CTR. FOR HUMANE TECHNOLOGY, <https://www.humanetech.com/policymakers> (last visited Apr. 18, 2022).

¹⁵⁵ *Policy Reforms Toolkit*, CTR. FOR HUMANE TECHNOLOGY, <https://www.humanetech.com/policy-reforms> (last visited Apr. 17, 2022).

¹⁵⁶ The Act is endorsed by Common Sense Media, the American Psychological Association, the 5Rights Foundation, American Compass, the Internet Accountability Project, American Principles Project, and the Digital Progress Institute. *Blumenthal & Blackburn Introduce Comprehensive Kids’ Online Safety Legislation*, RICHARD BLUMENTHAL (Feb. 16, 2022), <https://www.blumenthal.senate.gov/newsroom/press/release/blumenthal-and-blackburn-introduce-comprehensive-kids-online-safety-legislation>.

¹⁵⁷ Kids Online Safety Act, S. 3663, 117th Cong. (2022).

safeguards, and transparency” to protect their children online.¹⁵⁸ If passed, the bill would create a duty of care for children sixteen and under who use social media platforms. This duty requires platforms to “act in the best interests of minors” using the platform and work to mitigate and prevent specific harms like self-harm, eating disorders, and more.¹⁵⁹ The Federal Trade Commission and state Attorneys General would be responsible for enforcement.

In addition to creating a duty of care, the Act requires “social media platforms [to] provide minors with options to protect their information, disable addictive product features and opt out of the algorithmic recommendations.”¹⁶⁰ Other aspects include an annual independent audit of the platform to assess risk to minors, more parental control over social media use, and an explanation for minors of how the algorithmic recommendation system uses personal data.¹⁶¹

Some privacy advocates are concerned that the Act is too “heavy-handed.”¹⁶² The non-profit Electronic Frontier Foundation, an organization focused on online civil liberties, is concerned with the Act. It would force data to be provided to researchers, have an age-verification system, and allow parental controls that could potentially block a large amount of content.¹⁶³ They believe the duty of care and parental controls will lead to over-censorship. Additionally, the Act “would empower the Texas attorney general to define material that is harmful to children.”¹⁶⁴ As the Act stands now, it could be applied very differently in states like New York and Texas.¹⁶⁵

Despite some advocates’ concerns, the Act is the best current way to make social media companies mitigate harms to adolescents. Congress may modify it before it is voted on to address privacy concerns. If the Act stalls, it will hurt social media companies more than help them. Parents see the effects digital platforms have on their

¹⁵⁸ *Blumenthal & Blackburn Introduce Comprehensive Kids’ Online Safety Legislation*, *supra* note 156.

¹⁵⁹ *The Kids Online Safety Act of 2022: Section-by-Section Summary*, https://www.blumenthal.senate.gov/imo/media/doc/kids_online_safety_act_-_section_by_section.pdf (last visited Apr. 25, 2022).

¹⁶⁰ *Blumenthal & Blackburn Introduce Comprehensive Kids’ Online Safety Legislation*, *supra* note 156.

¹⁶¹ *Id.*

¹⁶² Jason Kelley, *The Kids Online Safety Act is a Heavy-Handed Plan to Force Platforms to Spy on Young People*, THE ELECTRONIC FRONTIER FOUNDATION (Mar. 24, 2022), <https://www.eff.org/deeplinks/2022/03/kids-online-safety-act-heavy-handed-plan-force-platforms-spy-young-people>.

¹⁶³ *Id.*

¹⁶⁴ *Id.*

¹⁶⁵ *Id.*

children.¹⁶⁶ If companies do nothing, parents could stop letting their children use social platforms.

Likely in response to congressional hearings and proposed legislation, YouTube, TikTok, Instagram, and Snapchat created break reminders, restricted modes filtering content, added time limits on push notifications, and more.¹⁶⁷ These social media platforms are trying to protect minors' privacy and make the platforms safer.¹⁶⁸ TikTok requires a password once a time limit has been reached. Instagram pops up a break reminder, which is easily circumvented so the user can continue scrolling. These efforts are a step, but when Instagram simply "reminds" users to take a break without any other actions, they fall short. Instagram's breaks are the equivalent of a cigarette company tapping a chain smoker on the shoulder mid-cigarette and reminding them to take a breath of fresh air. Clearly, more can be done.

"The Screentime Consultant," "Wait Until 8th," and the Center for Humane Technology were created to advocate for change. "The Screentime Consultant," a business started by a former teacher, coaches parents, corporations, and schools to "find balance with screentime."¹⁶⁹ She notes there are benefits from the online world, but it "get[s] complicated when it comes to children, whose brains are very different from adult brains."¹⁷⁰ As a teacher, she saw firsthand students' transition from life without social media to a culture relying on it.¹⁷¹ She advocates for being "tech-intentional" and finding a balance between no social media and too much.

Another advocacy group "Wait Until 8th" encourages parents to "let kids be kids a little longer" and wait to have smart phones until eighth grade.¹⁷² "Smart phones are like slot machines in your children's pocket constantly persuading them to crave more."¹⁷³ The

¹⁶⁶ Children as young as fourteen are contemplating suicide because of the pressures of social media. One mother said, "It became really addictive [for her] – the sense that you always have to be on, and always have to be responding to someone in order to be seen or to exist." Samantha Murphy Kelly, *Parents of the Social Media Generation are Not Ok*, CNN (Dec. 8 2021), <https://www.cnn.com/2021/12/08/tech/social-media-parents/index.html>.

¹⁶⁷ See Julia Jargon, *How to Use Parental Controls on YouTube, TikTok, Instagram and Snapchat*, THE WALL ST. J. (Apr. 16, 2022, 9:00 AM), https://www.wsj.com/articles/how-to-use-parental-controls-on-youtube-tiktok-instagram-and-snapchat-11650065233?mod=tech_featst.

¹⁶⁸ *Id.*

¹⁶⁹ *Meet Emily, THE SCREENTIME CONSULTANT*, <https://thescreentimeconsultant.com/about/> (last visited Apr. 20, 2022).

¹⁷⁰ *Meet Emily, supra* note 169.

¹⁷¹ *Id.*

¹⁷² WAIT UNTIL 8TH, <https://www.waituntil8th.org> (last visited Apr. 4, 2022).

¹⁷³ *Why Wait?*, WAIT UNTIL 8TH, <https://www.waituntil8th.org/why-wait> (last visited Apr. 4, 2022).

advocacy group notes multiple ways smartphones are difficult for children. They are (1) addicting, (2) distracting from academics, (3) altering children’s brains with excessive use, (4) impairing sleep, (5) interfering with relationships, (6) increasing the risk for anxiety and depression, (7) putting children at risk for cyber bullying, and (8) exposing them to sexual content.¹⁷⁴ With this group, parents pledge to delay giving their children smartphones until 8th grade; however, the pledge is only effective if they can convince ten other families in their child’s grade at school to agree to pledge too.¹⁷⁵ It is a clever way to rally parents together to help their children.

Some of the biggest names in technology restrict technology use in their own homes.¹⁷⁶ In 2014, Steve Jobs noted that his home was “fairly tech-free” and technology was limited for his children.¹⁷⁷ In 2017, Google’s CEO Sundar Pichai said that his middle school son did not own a cellphone and that TV was limited in his house.¹⁷⁸ In 2019, YouTube’s CEO, Susan Wojcicki said that her children have self-control methods for their technology use.¹⁷⁹ Snapchat’s co-founder, Evan Spiegel, limited his eight-year-old’s screen time to one-and-a-half hours per week.¹⁸⁰ Apple’s CEO, Tim Cook said, “I don’t have a kid, but I have a nephew . . . There are some things that I won’t allow; I don’t want them on a social network.”¹⁸¹ These digital executives intimately know the technology and restrict it in their families’ lives. If they are concerned enough to limit use, average people should consider doing so as well.

Tristan Harris, founder of the Center for Humane Technology and former Google design ethicist, is leading the charge as former technology employees blow the whistle on social media companies. These employees include the founding father of virtual reality, the former Senior Director of Product at Twitter, the former Head of User Experience at Mozilla, a former Operations Manager at Facebook, a former Experience Design Consultant at Google, the

¹⁷⁴ *Why Wait?*, *supra* note 173.

¹⁷⁵ *Take the Pledge*, WAIT UNTIL 8TH, <https://www.waituntil8th.org/take-the-pledge> (last visited Apr. 4, 2022).

¹⁷⁶ Canela López, *6 Tech Executives Who Raise their Kids Tech-Free or Seriously Limit Their Screen Time*, BUSINESS INSIDER (Mar. 5, 2020), <https://www.businessinsider.com/tech-execs-screen-time-children-bill-gates-steve-jobs-2019-9#snapchat-cofounder-and-ceo-evan-spiegel-and-former-victorias-secret-angel-miranda-kerr-limit-their-8-year-olds-screen-time-to-15-hours-per-week-6>.

¹⁷⁷ *Id.*

¹⁷⁸ *Id.*

¹⁷⁹ Canela López, *supra* note 176.

¹⁸⁰ *Id.*

¹⁸¹ Zameena Mejia, *Apple CEO Tim Cook: Don’t Let Your Kids Use Social Media*, CNBC (Jan. 23, 2018, 10:03 AM), <https://www.cnbc.com/2018/01/23/apple-ceo-tim-cook-dont-let-your-kids-use-social-media.html>.

former Director of Monetization at Facebook, the former Engineering Lead at Facebook, a former software engineer at Google, the former Senior Vice President of Engineering at Twitter, and the former Director of Corporate PR at Apple.¹⁸² These tech industry veterans are now advocating for humane technology, which recognizes that technology is not neutral, that the human brain is vulnerable, and that a cultural change must occur in technology product development.¹⁸³ To do this, the market needs to reward humane technology and incentivize companies to shift their practices from viewing humans as extractable resources to viewing them for their inherent dignity and worth.¹⁸⁴

VI. RECOMMENDATIONS FOR SOCIAL MEDIA COMPANIES AND CONSUMERS

Because of the harms, especially to children, social media companies and consumers need to reevaluate social media's role in daily life. By taking steps to protect children, social media platforms will build back goodwill and trust with their users. Consumers can learn to have a healthy, balanced relationship with social media.

a. SOCIAL MEDIA COMPANIES

Digital Companies need to empower users and support mental health. They should:

- (1) Voluntarily implement aspects of the KIDS Online Safety Act like opting-out of the recommendation systems and addictive features of the platform, as well as independently auditing the risk of harm the platform poses to minors. Additional studies should be conducted on social media's dopamine release and its potential harms to children.
- (2) Work with child psychologists to create default boundaries on the platform. One example is time limits. After the time limit is reached, the user could be cut off from the platform or the platform could switch to grayscale making it less desirable. Some platforms are already considering creating a separate platform for younger users.
- (3) Take the online course, *Foundations of Humane Technology*. The Center for Humane Technology currently offers a free course for technologists.¹⁸⁵ It helps coders shift their perspective and change their behaviors when designing

¹⁸² The Social Dilemma (Exposure Labs 2020).

¹⁸³ *For Technologists*, CTR. FOR HUMANE TECHNOLOGY, <https://www.humanetech.com/technologists> (visited March 18, 2022).

¹⁸⁴ *See id.*

¹⁸⁵ *Foundations of Humane Technology*, Ctr. For Humane Technology, <https://www.humanetech.com/course> (last visited Apr. 17, 2022).

social media platforms.¹⁸⁶ Hopefully this will help shift the way platforms view users.

- (4) Create similar boundaries for adults. A growing group of people are concerned about how social media is changing their brains due to dopamine feedback loops. Good faith attempts by digital companies to combat this would create goodwill and rebuild trust.

b. SOCIAL MEDIA CONSUMERS

Social media consumers need to create their own boundaries. Waiting for change from large companies and Congress takes too long. Consumers could:

- (1) Participate in in-person activities without any screens. Building in daily activities like going for a walk, playing sports, drinking coffee with friends, and talking with family is imperative. For youth, building relationships and learning interpersonal skills happens best in the real world, not the digital one.
- (2) Limit time on social media platforms. Youth need boundaries on social media. It is important to unplug, think, and be bored. If a child constantly has a phone in their hand, they never learn how to solve their boredom and do not need to use their creativity.
- (3) Model a healthy relationship with social media. Adults need to model healthy behavior because children watch and learn from the people around them. It is futile to set time limits and advocate for a balanced relationship with social media if a parent will not set the example.
- (4) Consider a social media detox. The good news is that dopamine pathways can be reset. Whether it is twenty-four hours without social media or a week, unplugging will help reset dopamine pathways in the brain.¹⁸⁷ In cases where someone is addicted to social media, they may need as long as a month without social media.¹⁸⁸ Once the pathway is reset, natural rewards will be pleasurable again!

Users can put healthy boundaries in place to keep them from overconsuming. Social media has many benefits, but society must reevaluate social media's place in daily life.

¹⁸⁶ *Foundations of Humane Technology*, *supra* note 185.

¹⁸⁷ Anna Lembke, *supra* note 54, at 78-79.

¹⁸⁸ *Id.*

VII. CONCLUSION

This research paper was undertaken to explore social media's impact on vulnerable communities. Society has underestimated the impact these platforms have on mental health and brain development. Studies of vulnerable communities, like children, have lagged. Due to persuasive technology, the architects of digital platforms have developed addictive technologies in the pursuit of users' attention. They use behavioral science to hijack the dopamine pathways and give bursts of dopamine to keep users engaged on the platform. While this is concerning for all users, it is most concerning for children. Children's brains are not fully developed. Social media is resetting their dopamine pathways so that digital interactions are more pleasurable than non-digital interactions. Even when adolescents realize they feel worse on social media, they lack the self-control to stop the cycle of use.

Boundaries are the best way to protect children. Time limits from parents and social media companies, as well as transparency, would be beneficial. The KIDS Online Safety Act, or a modified version, would force these companies to reevaluate their effects on children. "A human being is worth more if they are addicted, narcissistic, outraged, polarized, and disinformed than if they are a human being, and that's the business model that is causing these outcomes."¹⁸⁹ This is unsustainable and harms society. Change needs to happen. Social media companies should strive to be a part of the change.

¹⁸⁹ N.Y. Times Events, *The N.Y. Times Debate at The World Econ. F.: Big Tech Cannot be Trusted to Self-Regulate*, YOUTUBE (Jan. 31, 2020), <https://youtu.be/wJJFD851-o4>.