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EXHIBIT 19

**Tab 12 – April 18, 2025 Expert Report of Anna
Lembke**

EXPERT REPORT, ANNA LEMBKE, M.D.

April 18, 2025

RELATING TO: SOCIAL MEDIA LITIGATION

A. Opinions

For the reasons set forth in detail in this Report, I hold the following opinions:

1. **Addiction is a chronic, relapsing, and remitting brain disease as evidenced by continued, compulsive use of a substance or engagement in a behavior despite harmful consequences.**
2. **Social media addiction has been accepted and validated as a psychiatric condition by recognized authorities and peer-reviewed literature.**
3. **Addictive social media exploit our innate need for human connection by increasing access, quantity, potency, novelty, and uncertainty of social rewards, leading to brain and behavioral changes consistent with addiction. Young people are especially vulnerable to these harms.**
4. **Defendants exploit behavioral reward mechanisms with their addictive and unsafe social media products targeted at kids. Defendants' own documents provide evidence that their social media products are addictive.**
5. **Addiction to social media can adversely affect youth mental health, particularly among those with co-occurring psychiatric disorders. Conversely, limiting social media use can improve youth mental health. While some users may benefit from social media, such benefit does not negate the harm caused to a substantial population of users.**

B. Background and Qualification

1. I am Professor of Psychiatry and Addiction Medicine, Chief of the Addiction Medicine Dual Diagnosis Clinic, Medical Director of Addiction Medicine, and Program Director of the Addiction Medicine Fellowship, in the Department of Psychiatry and Behavioral Sciences at Stanford University School of Medicine. I am also Director of the Taube Youth Addiction Initiative which includes the Stanford Adolescent Addiction Medicine Dual Diagnosis Clinic (*Recovery Clinic*). I began my faculty career at Stanford in 2003. A true copy of my current CV is attached to this Report as Exhibit A.
2. I received my undergraduate degree in Humanities from Yale University graduating *summa cum laude* in 1989, and my medical degree from Stanford University in 1995, where I also completed a partial residency in Pathology (1997) and a full residency in Psychiatry (2000), as well as a Fellowship in Mood Disorders, Department of Psychiatry and Behavioral Sciences (2002).
3. I have been licensed to practice medicine in the State of California from 1995 to the present. I am a diplomate of the American Board of Psychiatry and Neurology (2003; recertified, 2013), a diplomate of the American Board of Addiction Medicine (2013), and a diplomate of the American Board of Preventive Medicine (2021).

4. From 2001 to the present, I have taught medical students, residents, and fellows at Stanford University School of Medicine, on a diversity of topics related to psychiatry, addiction, and pain. For example, from 2004 to the present, I have given annual lectures on addiction medicine within the Practice of Medicine (POM) series for Stanford medical students, including topics such as the neurobiology of addiction, how doctors should intervene when they detect addiction, and how to have difficult conversations with patients on the topic of addiction. I received the Stanford Award for Excellence in Academic Teaching, Department of Psychiatry, in 2014, and again in 2018.

5. In 2013, I founded and became the Training/Program Director for Stanford's Addiction Medicine Fellowship, a post-graduate sub-specialty training year in the treatment of addiction for any medical graduate of a U.S. or Canadian medical school and ACGME-accredited residency. Many of our fellows are interested in our training program because of its emphasis on behavioral addictions including digital media addiction. In 2020 I was awarded the ASAM Training Directors Award "for outstanding training in the evaluation, treatment, research and teaching of substance use disorders."

6. As a full-time faculty at the Stanford University School of Medicine, I regularly treat patients with addiction to substances and behaviors, including social media addiction. I treat teenagers and adults addicted to social media, the majority of whom began using social media in early adolescence and progressed over time to social media related harms, including but not limited to depression, anxiety, sleep disturbances, eating disorders, body dysmorphia, self-harm, and suicidal ideation.

7. In 2015, I received the Stanford Chairman's Award for Clinical Innovation for developing inpatient and outpatient clinical services dedicated to helping people with addiction.

8. From 2015 to 2019, I served on the Board of the California Society of Addiction Medicine (CSAM). I have been a member of CSAM, and the American Society of Addiction Medicine (ASAM), since 2011.

9. In 2015-2016 I chaired the Planning Committee for the California Society of Addiction Medicine (CSAM) Annual Addiction Medicine Conference.

10. In 2016, I became president of the Addiction Medicine Fellowship Directors Association (AMFDA).

11. Since 2016, I have chaired the Addiction Medicine Task Force, Stanford University School of Medicine. The goal of the Task Force is to re-evaluate and re-create the medical school curriculum on addiction and safe prescribing of addictive substances. I have served as MedScholar Advisor on the topic of *Developing the Addiction Curriculum at Stanford*, Stanford University School of Medicine. The new medical school curriculum we have created includes didactics on the neurobiology and treatment of addiction.

12. In 2019, the Stanford Center for Health Education asked me to lead and design an online course on addiction for Stanford learners all over the world. This course is called "The Psychology of Addiction and Recovery" and explores concepts of addiction through time, risk

factors for addiction, and treatments for addiction including biological, psychological, and public policy approaches. The course has been available as an enduring online course since August 2020.

13. I am the author of a book on the prescription drug epidemic: *Drug Dealer, MD: How Doctors Were Duped, Patients Got Hooked, and Why It's So Hard to Stop* (Johns Hopkins University Press, 2016).¹ My book was highlighted in the *New York Times* as one of the top five books to read to understand the opioid epidemic.²

14. I have taught extensively at Stanford University and other institutions of higher learning on the ways in which the Pharmaceutical Opioid Industry marketed prescription opioids as both more effective and less addictive than they really are. I have given lectures on these subjects to Stanford undergraduates, Stanford business, law, public health, and medical students, among others. I have also spoken on these topics widely outside of Stanford.

15. I have published over 100 peer-reviewed articles, chapters, and commentaries, which have appeared in the *New England Journal of Medicine*, *Journal of the American Medical Association*, *Pain Medicine*, *Journal of General Internal Medicine*, *Addiction*, and other peer reviewed journals. Many of these publications address the diagnosis and treatment of addiction. I have also published articles on the importance of teaching addiction medicine in medical school, residency, and fellowship.

16. In 2021, I published a book on addiction called *Dopamine Nation: Finding Balance in the Age of Indulgence* (Dutton, 2021),³ a *New York Times* and *Los Angeles Times* bestseller, which has been translated into more than 35 languages. *Dopamine Nation* explores the neuroscience and treatment of addiction, including the problem of digital media.

17. Also in 2021, I appeared in the Netflix documentary *The Social Dilemma*, an unvarnished look at the impact of social media on our lives.

18. In 2024, I published *The Official Dopamine Nation Workbook* (Dutton, 2024),⁴ a step-by-step guide for focusing on how to manage compulsive over-consumption of digital media including social media. *The Workbook* is currently being adapted for use in middle schools and high schools, and as a primary teaching tool on addiction in advanced degree programs in psychology.

19. Since the publication of my book, *Dopamine Nation*, I have been invited to make presentations all over the world to doctors, the public, policy makers, and legislators regarding

¹ Lembke, Anna. *Drug Dealer, MD: How Doctors Were Duped, Patients Got Hooked, and Why Its so Hard to Stop*. Johns Hopkins University Press, 2016.

² Zuger, A. (2018, December 17). A Doctor's Guide to What to Read on the Opioid Crisis. *The New York Times*. <https://nytimes.com/2018/12/17/books/review/opioid-abuse-drug-dealer-anna-lembke.html>

³ Lembke, A. (2021). *Dopamine nation: finding balance in the age of indulgence*. Dutton, an imprint of Penguin Random House LLC.

⁴ Lembke, A. (2024). *The Official Dopamine Nation Workbook: A Practical Guide to Finding Balance in the Age of Indulgence*. Dutton, an imprint of Penguin Random House LLC.

the rising problem of social media addiction, particularly among youth. I spent the last year traveling the country talking to educators, parents, and mental health experts about the risks of excessive digital media use on youth mental health.

20. To help grow the national conversation around this issue and inform government policy, I testified as an invited expert at the U.S. Senate Judiciary Committee’s hearing Examining Kids’ Online Safety. Additionally, I testified for the House Commerce Finance and Policy Committee, the Minnesota House of Representatives, and the Minnesota State Senate. I also brought our expertise at Stanford to legislators in Sacramento to help pass Senate Bill 976, the Protecting Our Kids from Social Media Addiction Act. This bill would make social media less harmful for kids by deeming it unlawful for internet-based services and applications to provide an addictive feed to minors. Furthermore, the bill restricts these addictive apps from sending notifications to minors between 8 a.m. and 3 p.m. and between 12 a.m. and 6 a.m. Monday through Friday from September through May. This bill has the potential to increase our capacity to protect children online.

21. In 2025, I was asked to participate in the *Stanford Youth Safety and Digital Wellbeing Report*, sponsored by the Stanford Center for Digital Health, which convened an international workshop “to focus on risk-based approaches to mitigating social specific harms, including those affecting youth.” Of particular relevance to my Report in this litigation, the workshop explored “harms facilitated by technological design choices of technology platforms,” including but not limited to “Loss of control, addiction, excessive use,” “Displacement of other beneficial activities (including sleep, exercise and in-person social activities),” “upward social comparisons,” “Psychological impacts, including depression, sadness, anxiety, loneliness, lower positive well-being indicators, such as happiness, self-esteem,” and “algorithmic biases and risks, including recommendations of problematic content or discrimination in decision-making.” This was not a consensus workshop. Harms were included if the majority agreed they should be included. To my knowledge the report produced from this workshop has not been externally peer-reviewed.

22. In forming the opinions expressed in this Report, I have relied on my medical training and more than twenty years of clinical experience and research in addiction. Specifically for this Report, I have considered the materials listed in Exhibit B, attached.

23. I hold the opinions stated in this Report to a reasonable degree of scientific certainty.

C. Detailed Statement of Opinions

1. Addiction is a chronic, relapsing, and remitting brain disease as evidenced by continued, compulsive use of a substance or engagement in a behavior despite harmful consequences.

- a. Addiction is the continued, compulsive use of a substance or engagement in a behavior despite harm to self and/or others. The pattern we see when a person gets addicted to behaviors like gambling, gaming, sex, and social media is similar to when they get addicted to drugs or alcohol. An individual often starts

the behavior for fun or to solve a problem. The problem can range from depression and anxiety to loneliness, boredom, and more. If the behavior is rewarding or problem-solving, the individual will continue to engage in it, especially given unlimited access, abundant quantity, high potency, novelty, and uncertainty. Over time, the individual finds it difficult to stop even when they want to, eventually resulting in continued, compulsive use despite harm.

- b. Addiction is a brain disease with distinct brain changes that occur as a result of exposure to addictive substances and behaviors, but there is as yet no brain scan or blood test to diagnose addiction. The diagnosis is based on phenomenology, that is to say, patterns of behavior that repeat themselves across individuals, cultures, time periods, and geographies. These patterns of behavior are distinct, predictable, and recognizable.
- c. There are various sources of definitions of addiction. These sources include the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5),⁵ the American Society of Addiction Medicine, the International Classification of Diseases, 11th edition (ICD-11),⁶ and peer-reviewed literature. In general, these sources define and assess addiction/ “use disorder” according to a series of factors or criteria.
- d. The DSM-5 denotes 11 different criteria to capture the patterns of behavior that are used to diagnose addiction.⁷ The DSM-5 itself does not use the term *addiction*. Instead, it uses the term *use disorder*, as in *alcohol use disorder*, *opioid use disorder*, *nicotine use disorder*, etc.⁸ Such terminology aligns with current views of the condition as a brain disease, while minimizing labels that stigmatize patients and create barriers to seeking treatment. Other sources may identify a different number of criteria, or may be worded differently, but such standards generally include the central aspects of addiction/use disorder.
- e. A short-hand way to remember these criteria is the “4 C’s”: Control, compulsion, craving, and consequences, especially *continued use despite consequences*, as well as tolerance and withdrawal. Not all of these criteria need to be present to meet the threshold for addiction.
 - i. Control: Out-of-control use, for example using more than intended, or an inability to cut back use when necessary.

⁵ American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). <https://doi.org/10.1176/appi.books.9780890425596>

⁶ World Health Organization. (2019). International Statistical Classification of Diseases and Related Health Problems (11th ed.). <https://icd.who.int/>

⁷ American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). <https://doi.org/10.1176/appi.books.9780890425596>, at pp.483-484

⁸ American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). <https://doi.org/10.1176/appi.books.9780890425596>, at pp. xxv-xxiv.

- ii. Compulsion: Mental preoccupation with using against a conscious desire to abstain.
 - iii. Craving: Physiologic and/or mental states of wanting.
 - iv. Consequences: Physical, mental, social, legal, economic, interpersonal, and other problems that arise as a result of use, yet which still do not deter use, including opportunity costs – other things not being done as a result of addictive behaviors.
 - v. Tolerance: Needing more over time to get the same effect, or finding that a given dose is no has the same effect.
 - vi. Withdrawal: Experiencing physical and mental distress in the absence of use.
- f. Addiction is a spectrum disorder, divided into mild, moderate, and severe, based on the number of criteria met.⁹ At least two criteria must be met to support a diagnosis of a use disorder.¹⁰
- g. Quantity and frequency of consumption are not included in the criteria for addiction, although they are correlated with addictive use. The more of a substance or behavior a person uses, and the more often they use it, the more likely they are to meet the criteria for a use disorder. But heavy use does not define addiction, and even limited use can meet criteria for a use disorder.
- h. Risky use of substances and behaviors, sometimes called “misuse,” includes behaviors associated with harm that may or may not be coincident with addiction. Examples include drinking while driving, which can occur in persons with or without an alcohol addiction.¹¹
- i. The American Society of Addiction Medicine (ASAM) has defined addiction as follows: “Addiction is a treatable, chronic medical disease involving complex interactions among brain circuits, genetics, the environment, and an individual’s life experiences. People with addiction use substances *or engage in behaviors* that become compulsive and often continue despite harmful consequences. Prevention efforts and treatment approaches for addiction are

⁹ See American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). <https://doi.org/10.1176/appi.books.9780890425596>, at p. 483

¹⁰ See American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). <https://doi.org/10.1176/appi.books.9780890425596>, at p. 483..

¹¹ NIAAA. (2025, February) Understanding Alcohol Drinking Patterns. National Institutes of Health. <https://www.niaaa.nih.gov/alcohols-effects-health/alcohol-drinking-patterns>.

generally as successful as those for other chronic diseases.”¹² This ASAM definition of addiction is consistent with but not identical to that of DSM-5. The ASAM definition does not single out any specific substance or behavior, highlighting the idea that all addictive drugs and behaviors work on the same common brain reward pathway.

- j. Factors that increase vulnerability to addiction include genetic, developmental, and environmental factors (nature, nurture, and neighborhood). The more risk factors a person has, the more likely they are to get addicted.¹³ Genes (nature) account for 40 to 60 percent of the risk of getting addicted. Teenagers and people with psychiatric disorders are at greater risk of addiction than others. The earlier a person begins to use a drug, the more likely they are to develop problems related to that drug. Developmental risk factors (nurture) include childhood trauma and early exposure to parents who model addictive behaviors. Environmental risk factors (neighborhood) include poverty and access. When supply of an addictive drug or behavior is increased, more people become addicted to and suffer the harms of that drug or behavior. Of note, addiction can also occur in the absence of risk factors. Repeated exposure to addictive substances and behaviors alone is enough to cause addiction in some cases.

2. Social media addiction has been accepted and validated as a psychiatric condition by recognized authorities and peer-reviewed literature.

- a. Social media addiction goes by different terms in the medical literature, including *social media disorder*, *social media use disorder*, *problematic use of social media*, *problematic social media use*, and so on. Although the term *problematic use* and its variants are often used as a synonym for social media addiction, it is also used in some contexts to refer to social media use short of addiction but which causes certain similar harms.

¹² American Society of Addiction Medicine (ASAM) Definition of Addiction. [https://www.asam.org/docs/default-source/quality-science/asam's-2019-definition-of-addiction-\(1\).pdf?sfvrsn=b8b64fc2_2](https://www.asam.org/docs/default-source/quality-science/asam's-2019-definition-of-addiction-(1).pdf?sfvrsn=b8b64fc2_2), (adopted September 15, 2019), at p. 2. (emphasis added). Prior to 2019, ASAM defined addiction as follows: “Addiction is a primary, chronic disease of brain reward, motivation, memory and related circuitry. Dysfunction in these circuits leads to characteristic biological, psychological, social and spiritual manifestations. This is reflected in an individual pathologically pursuing reward and/or relief by substance use and other behaviors. Addiction is characterized by inability to consistently abstain, impairment in behavioral control, craving, diminished recognition of significant problems with one’s behaviors and interpersonal relationships, and a dysfunctional emotional response. Like other chronic diseases, addiction often involves cycles of relapse and remission. Without treatment or engagement in recovery activities, addiction is progressive and can result in disability or premature death.” American Society of Addiction Medicine. (2011. August 15). Public Policy Statement: Short Definition of Addiction. https://web.archive.org/web/20181007192411/https://www.asam.org/docs/default-source/public-policy-statements/1definition_of_addiction_short_4-11.pdf?sfvrsn=6e36cc2

¹³ NIDA. 2020, July 6. Drug Misuse and Addiction. Retrieved from <https://nida.nih.gov/publications/drugs-brains-behavior-science-addiction/drug-misuse-addiction> on 2025, March 29.

- b. The Social Media Disorder (SMD) Scale, a 9-item, psychometrically sound instrument based on the nine DSM-5 criteria for internet gaming disorder,¹⁴ is described in a published article by van den Eijnden, R.J.J.M., Lemmens, J.S., & Valkenburg P.M. (2016).¹⁵
 - i. Van den Eijnden was a co-author on a larger follow-up study in which van den Eijnden and co-authors concluded: “The social media disorder scale appears to be suitable for measuring and comparing problematic social media use among young adolescents across many national contexts.”¹⁶
 - ii. Based on the reliance upon the Social Media Disorder Scale in the peer-reviewed literature and by a recognized authoritative source in the WHO as described below, the Social Media Disorder Scale (SMDS) is a valid, scientifically accepted method to diagnose social media addiction.
 - iii. Although I do not rely on the Social Media Disorder Scale itself in my own clinical practice, I rely on the same factors listed in the Social Media Disorder Scale. As noted, all recognized methods for diagnosis of addiction/use disorder/problematic use, incorporate similar assessment criteria (“the 4 Cs”).
- c. In 2024, The World Health Organization/ Health Behaviour in School Age Children (WHO/HBSC) cited Boer/van den Eijnden’s Social Media Disorder Scale publications as the basis for its conclusions regarding an increase in Problematic Social Media Use, assessed as follows:
 - i. “Adolescents were asked to report about symptoms of problematic (addictive-like) SMU using the Social Media Disorder Scale (6,10), a nine-item measure to which respondents answered with yes or no. Findings in the Annex represent adolescents who answered yes to six or more symptoms and were therefore categorized as problematic social media users.”¹⁷

¹⁴ van den Eijnden, R. J. J. M., Lemmens, J. S., & Valkenburg, P. M. (2016). The Social Media Disorder Scale. *Computers in Human Behavior*, 61, 478–487. <https://doi.org/10.1016/j.chb.2016.03.038>.

¹⁵ van den Eijnden, R. J. J. M., Lemmens, J. S., & Valkenburg, P. M. (2016). The Social Media Disorder Scale. *Computers in Human Behavior*, 61, 478–487. <https://doi.org/10.1016/j.chb.2016.03.038>.

¹⁶ Boer, M., van den Eijnden, R. J. J. M., Finkenauer, C., Boniel-Nissim, M., Marino, C., Inchley, J., Cosma, A., Paakkari, L., & Stevens, G. W. J. M. (2022). Cross-national validation of the social media disorder scale: findings from adolescents from 44 countries. *Addiction* (Abingdon, England), 117(3), 784–795. <https://doi.org/10.1111/add.15709>, at p. 784.

¹⁷ Boniel-Nissim M, Marino C, Galeotti T, Blinka L, Ozoliņa K, Craig W et al.(2024) A focus on adolescent social media use and gaming in Europe, central Asia and Canada. *Health Behaviour in School-aged Children*

- ii. Using the Social Media Disorder Scale, the WHO/HBSC study found that problematic social media use (PSMU) had increased from approximately 7% to approximately 11% during the 4-year period from 2018 to 2022.¹⁸
- iii. The World Health Organization has included internet-use related disorders in 11th Revision of the International Classification of Diseases (ICD-11) such as gaming disorder, which is defined as a pattern of gaming behavior (“digital-gaming” or “video-gaming”) characterized by “impaired control over gaming...increasing priority given to gaming over other activities to the extent that gaming takes precedence over other interests and daily activities; and continuation or escalation of gaming despite the occurrence of negative consequences.”¹⁹ Researchers have transferred this criteria to assess Social Media Use Disorder.²⁰
- d. A February 2025 Report, “Young Consumers and Social Media,” described the results of a survey study conducted in Denmark exploring the problem of social media addiction.²¹
 - i. The report acknowledged the absence of a diagnosis of social media addiction in the DSM and ICD-11, yet freely used the term “social media addiction” as measured by the Bergen Social Media Addiction Scale, a six-item questionnaire: “Social media addiction is not recognized in diagnostic frameworks such as the *International Classification of Disease, Revision 11 (ICD-11)* or the *Diagnostic and Statistical Manual, Fifth Edition, Text Revision (DSM-5-TR)*,...but it has been defined broadly along the same diagnostic criteria as other behavioral addictions, such as pathological gambling or compulsive

international report from the 2021/2022 survey. Volume 6. Copenhagen: WHO Regional Office for Europe; 2024: CC BY-NC-SA 3.0 IGO, at p. 2. (emphasis in original).

¹⁸ Boniel-Nissim M, Marino C, Galeotti T, Blinka L, Ozoliņa K, Craig W et al. (2024) A focus on adolescent social media use and gaming in Europe, central Asia and Canada. Health Behaviour in School-aged Children international report from the 2021/2022 survey. Volume 6. Copenhagen: WHO Regional Office for Europe; 2024: CC BY-NC-SA 3.0 IGO, at p. vii.

¹⁹ World Health Organization. (2019). International Statistical Classification of Diseases and Related Health Problems (11th ed.). <https://icd.who.int/>, at pp. 561-562.

²⁰ Paschke, K., Austermann, M. I., & Thomasius, R. (2021). ICD-11-Based Assessment of Social Media Use Disorder in Adolescents: Development and Validation of the Social Media Use Disorder Scale for Adolescents. *Frontiers in psychiatry*, 12, 661483. <https://doi.org/10.3389/fpsy.2021.661483>.

²¹ Danish Competition and Consumer Authority. (2025). Young consumers and social media. <https://www.em.dk/Media/638744252848589136/KFST%20analyse%20-%20Young-consumers-and-social-media.pdf>

shopping. The concept also shares many commonalities with traditional substance dependencies such as nicotine and alcohol dependence.”²²

- ii. This report’s common usage of the term “addiction” in reference to social media, and the focus on the effects of social media addiction on well-being, support recognizing the disorder.
- iii. The Bergen Social Media Addiction Scale consists of six questions designed using items similar to those used to measure other behavioral addictions. “The scale was developed on the basis of the addiction theory, which measures addiction through six core components: salience, tolerance, mood modification, relapse, withdrawal, and conflict...”²³
- iv. The scale includes one statement for each component: “In the last few months, I have... “Spent a lot of time thinking about social media.” “Felt the need to use social media more and more.” “Used social media to forget about personal problems.” “Tried to cut down on the use of social media.” “Become restless or troubled if I was unable to use social media.” “Used or thought about social media so much that it has disrupted my schooling/education/work.”²⁴ Responses to each statement are scored on a graded Likert scale defined as follows: very rarely or never (1), rarely (2), sometimes (3), often (4), and very often or always (5).²⁵ The Bergen Social Media Addiction Scale questions are consistent with the 4 C’s of addiction, tolerance, and withdrawal.
- e. The American Psychiatric Association (APA) recently issued a statement regarding social media addiction:²⁶
 - i. “Social media addiction involves problematic and compulsive use of social media; an obsessive need to check and update social media

²² Danish Competition and Consumer Authority. (2025). Young consumers and social media. <https://www.em.dk/Media/638744252848589136/KFST%20analyse%20-%20Young-consumers-and-social-media.pdf>, p. 22. (emphasis in original)

²³ Danish Competition and Consumer Authority. (2025). Young consumers and social media. <https://www.em.dk/Media/638744252848589136/KFST%20analyse%20-%20Young-consumers-and-social-media.pdf>, p. 23.

²⁴ Danish Competition and Consumer Authority. (2025). Young consumers and social media. <https://www.em.dk/Media/638744252848589136/KFST%20analyse%20-%20Young-consumers-and-social-media.pdf>, p. 23.

²⁵ Danish Competition and Consumer Authority. (2025). Young consumers and social media. <https://www.em.dk/Media/638744252848589136/KFST%20analyse%20-%20Young-consumers-and-social-media.pdf>, p. 23.

²⁶ American Psychiatric Association (2024) What is Technology Addiction?. <https://www.psychiatry.org/patients-families/technology-addictions-social-media-and-more/what-is-technology-addiction>.

platforms, often resulting in problems in functioning and disrupted real-world relationships.²⁷

- ii. The “Physician Review” for this statement was dated February 2024.²⁸
- f. The DSM-5, which was issued in 2013 by the same organization, the APA, does not include a statement recognizing a diagnosis of social media addiction.
 - i. In my opinion, social media addiction should be recognized by the DSM for the reasons stated in this Report and by the sources cited herein. The fact that social media addiction has not yet been included in the DSM means little.
 - ii. Any new mental health disorder that arises in the population will take time before it is recognized by and incorporated into the DSM.
 - iii. The DSM is an imperfect compendium of mental diseases²⁹ and not the end all and be all of psychiatric diagnosis.
 - iv. A great deal of evidence has accumulated since 2013 on the subject of social media addiction, including but not limited to the sources cited above (van den Eijnden; Boer; WHO/HBSC), which document the validity of such a diagnosis.
 - v. The DSM-5, the International Classification of Diseases (ICD-11), and the American Psychiatric Association (APA) have all recognized the addictive nature of Internet gaming, which speaks to a consensus on the addictive potential of certain kinds of digital media. At the current time, gambling disorder is formally recognized in the DSM-5,³⁰ and Internet gaming disorder is in the appendix (section 3, potential disorders requiring further research).³¹
 - vi. The 2024 APA statement acknowledging the validity of, and defining the conditions for, “social media addiction,” is an accurate representation of the state of scientific evidence in 2025. It is reasonable to anticipate that the more current view espoused by the

²⁷ American Psychiatric Association (2024) What is Technology Addiction?. <https://www.psychiatry.org/patients-families/technology-addictions-social-media-and-more/what-is-technology-addiction>.

²⁸ American Psychiatric Association (2024) What is Technology Addiction?. <https://www.psychiatry.org/patients-families/technology-addictions-social-media-and-more/what-is-technology-addiction>.

²⁹ Davis, L. C., Diianni, A. T., Drumheller, S. R., Elansary, N. N., D'Ambrozio, G. N., Herrawi, F., Piper, B. J., & Cosgrove, L. (2024). Undisclosed financial conflicts of interest in DSM-5-TR: cross sectional analysis. *BMJ* (Clinical research ed.), 384, e076902. <https://doi.org/10.1136/bmj-2023-076902>

³⁰ American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.), at p. 585.

³¹ American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.), at p. 795.

APA in 2024 will be incorporated into the next edition of the DSM, when the lengthy process of review of the evidence developed since 2013 is completed.

- vii. Active discussion is underway on the inclusion of social media use disorder in the DSM.

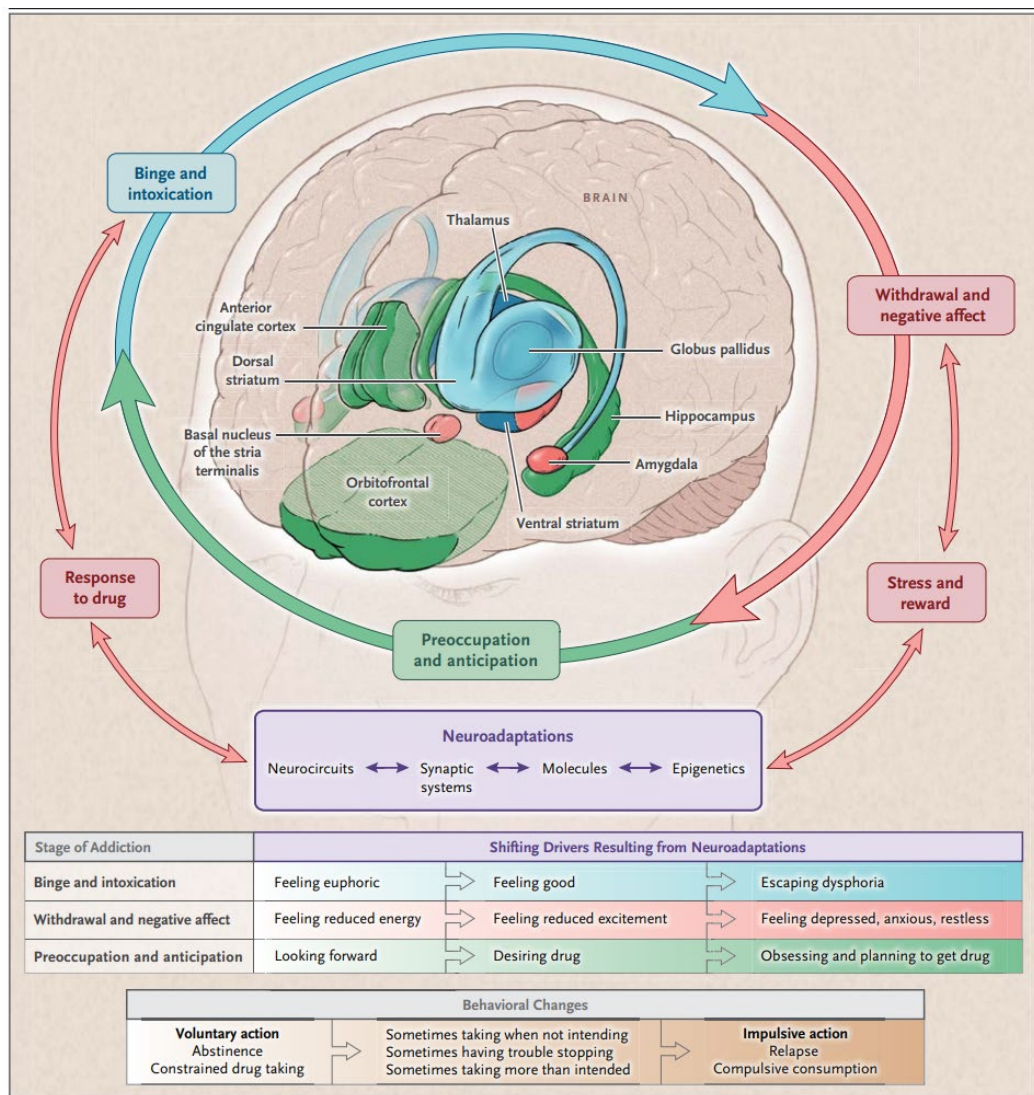
3. Addictive social media exploit our innate need for human connection by increasing access, quantity, potency, novelty, and uncertainty of social rewards, leading to brain and behavioral changes consistent with addiction. Young people are especially vulnerable to these harms.

- a. From a neuroscience perspective, addiction is a disorder of the brain's reward circuitry.³²
 - i. All addictive substances and behaviors mimic a reinforcing chemical or neural network that already exists in the brain, but in an ultra-potent, super-normal form, triggering the chemical cascade that activates the brain's reward pathway. Nicotine mimics endogenous acetylcholine and binds nicotinic receptors. Cannabis mimics endogenous cannabinoids and binds anandamide receptors. Opioids mimic endogenous endorphins and bind opioid receptors. And so on. Our brains did not evolve for these super-normal reinforcers in abundance, thereby setting up the cycle of intoxication, withdrawal, and neuroadaptation that leads to the disease of addiction.
 - ii. Reinforcing substances and behaviors temporarily increase dopamine firing in the brain's reward pathway. In order to accommodate the higher levels of dopamine release, the brain adapts by downregulating its own endogenous dopamine and its own endogenous dopamine receptors. This process is called neuroadaptation. With the repeated use of the substance or behavior, vulnerable individuals can enter a chronic dopamine deficit state, wherein the threshold for experiencing pleasure goes up, and the threshold for experiencing pain goes down. Addicted individuals then need the substance or behavior not to feel good, but simply to escape the pain of withdrawal.
 - iii. In severe forms of addiction, individuals commit all available resources to obtaining more of the substance or behavior, even forgoing natural rewards like food and social interaction.³³ By hijacking the brain's

³² Koob, G. F., & Volkow, N. D. (2010). Neurocircuitry of addiction. *Neuropsychopharmacology : official publication of the American College of Neuropsychopharmacology*, 35(1), 217–238. <https://doi.org/10.1038/npp.2009.110>

³³ Schultz W. Potential vulnerabilities of neuronal reward, risk, and decision mechanisms to addictive drugs. *Neuron*. 2011;69(4):603-617. doi:10.1016/j.neuron.2011.02.014.

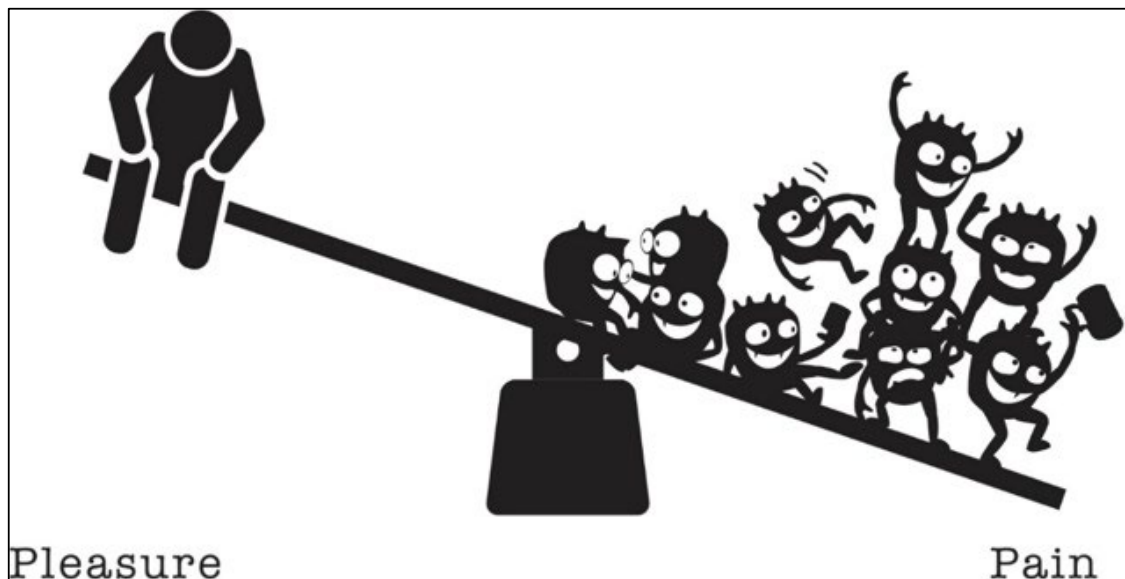
reward and motivational centers, addiction leads to compulsive, self-destructive consumption that overcomes the limits of voluntary choice. The cycle of neuroadaptation is illustrated below³⁴:



- b. Another way to understand this process of neuroadaptation to high-dopamine rewards that can lead to addiction is to use the metaphor of a pleasure-pain balance, like a teeter-totter in a kid's playground.

³⁴ Volkow, N. D., Koob, G. F., & McLellan, A. T. (2016). Neurobiologic Advances from the Brain Disease Model of Addiction. *The New England journal of medicine*, 374(4), 363–371. <https://doi.org/10.1056/NEJMra1511480>, Figure 1.

- i. When the beam is level with the ground, the individual is at baseline levels of dopamine firing, or what neuroscientists call *homeostasis*.
- ii. When the individual experiences pleasure, the beam tips one way. When they experience pain, the beam tips in the opposite direction.
- iii. One of the overarching rules governing the balance is that it wants to remain level, and the brain will work hard to restore a level balance with any deviation from neutrality. The way the brain restores homeostasis after a pleasurable stimulus is first by tilting an equal and opposite amount to the side of pain. You might imagine that as gremlins, representing neuroadaptation, hopping on the pain side of the teeter totter to bring it level again. But the gremlins like it on the teeter totter, so they don't get off as soon as it's level, they stay on until it has tipped an equal and opposite amount to the side of pain.
- iv. With repeated exposure over time to the same or similar reinforcing stimulus, the gremlins multiply and are eventually camped out on the pain side of the balance. Now the brain has changed its hedonic or joy set-point and needs more of the substance or behavior in more potent forms over time to get the same effect (tolerance). The process of the brain adapting to a chronic external stimulus is called *allostasis*. Eventually the individual is using the substance or behavior not to feel good (positive reinforcement), but just to stop feeling bad (negative reinforcement). This is the addicted brain.



- c. Human beings are social creatures. Our sociability has allowed us to survive and thrive over millions of years of evolution, enhancing our ability to find mates, shepherd scarce resources, and protect ourselves against enemies.
- d. Social media provide social validation and group affiliation at scale. Crowd-sourced social validation, or the promise thereof, combined with a quick turnaround for engagement and little up-front work, translates into a powerfully addictive reward.
- e. *Wanting but not liking* is a common aphorism to describe addiction, which captures the phenomenon of compulsively using a drug even after it has stopped being pleasurable or adaptive. A Harris Poll (2024), which surveyed a representative group of 1,006 U.S. adults aged 18–27, showed that 40% of participants agreed (11% strongly) with the statement that they “wish social media had never been invented.”³⁵
- f. Our innate desire for social connection is mediated by a cascade of brain chemicals that makes social connection feel good. A growing body of evidence demonstrates that social media activates the same reward pathway as drugs and alcohol, and people who develop social media addiction demonstrate similar brain changes as seen in individuals with other forms of addiction.
 - i. Oxytocin, our so-called *love hormone*, binds to dopamine releasing neurons in the brain’s reward pathway leading to an increase in dopamine release, which is why falling in love and other forms of social bonding activate the pleasure centers of the brain.³⁶
 - ii. Social validation and reputation enhancement light up the same reward pathway as drugs and alcohol. A study by Izuma et al. examined whether stimuli that communicate “acquiring a good reputation” activate the same reward circuitry as monetary rewards.³⁷ Nineteen (19) subjects participated in functional magnetic resonance imaging (fMRI) experiments involving monetary and social rewards. The authors found that acquiring a good reputation robustly activated reward-related brain areas and overlapped with the areas activated by monetary rewards.³⁸ The authors concluded, “Our findings support the idea of a ‘common

³⁵ The Harris Poll. (2024, October 9). What Gen Z thinks about its social media and smartphone usage - Harris Poll. Harris Poll. <https://theharrispoll.com/briefs/gen-z-social-media-smart-phones/>

³⁶ Hung, L. W., Neuner, S., Polepalli, J. S., Beier, K. T., Wright, M., Walsh, J. J., Lewis, E. M., Luo, L., Deisseroth, K., Dölen, G., & Malenka, R. C. (2017). Gating of social reward by oxytocin in the ventral tegmental area. *Science* (New York, N.Y.), 357(6358), 1406–1411. <https://doi.org/10.1126/science.aan4994>.

³⁷ Izuma, K., Saito, D. N., & Sadato, N. (2008). Processing of social and monetary rewards in the human striatum. *Neuron*, 58(2), 284–294. <https://doi.org/10.1016/j.neuron.2008.03.020>.

³⁸ Izuma, K., Saito, D. N., & Sadato, N. (2008). Processing of social and monetary rewards in the human striatum. *Neuron*, 58(2), 284–294. <https://doi.org/10.1016/j.neuron.2008.03.020>.

neural currency’ for rewards and represent an important first step toward a neural explanation for complex human social behaviors.”³⁹

- iii. Sherman and colleagues found that adolescents are more inclined to like Instagram-style photos that have been liked by others, and viewing these photos compared with photos that have been less-liked, is “associated with greater activity in neural regions implicated in reward processing, social cognition, imitation, and attention.”⁴⁰ This study highlights that the crowd-sourced, interactive, reciprocal nature of social media through *likes* and other similar design features increases the potency of the medium.
- iv. Davey and colleagues found that being “liked” in a mode akin to social media activates the brain’s reward pathway.⁴¹
- v. In 2011, Kim et al., published a brain imaging study showing similar effects on the dopamine brain reward system with digital media addiction as seen with other forms of addiction, specifically down-regulation of D2 dopamine receptors in the ventral striatum (reward circuitry). In their study “Reduced Striatal D2 Dopamine receptors in People with Internet Addiction,”⁴² the authors’ state, “An increasing amount of research has suggested that Internet addiction is associated with abnormalities in the dopaminergic brain system. We hypothesized that Internet addiction would be associated with reduced levels of dopaminergic receptor availability in the striatum compared with controls. To test this hypothesis, a radiolabeled ligand [11C]raclopride and positron emission tomography was used to assess dopamine D2 receptor binding potential in men with and without Internet addiction. Consistent with our prediction, individuals with Internet addiction showed reduced levels of dopamine D2 receptor availability in subdivisions of the striatum including the bilateral dorsal caudate and

³⁹ Izuma, K., Saito, D. N., & Sadato, N. (2008). Processing of social and monetary rewards in the human striatum. *Neuron*, 58(2), 284–294. <https://doi.org/10.1016/j.neuron.2008.03.020>, at p. 284.

⁴⁰ Sherman, L. E., Payton, A. A., Hernandez, L. M., Greenfield, P. M., & Dapretto, M. (2016). The Power of the Like in Adolescence: Effects of Peer Influence on Neural and Behavioral Responses to Social Media. *Psychological science*, 27(7), 1027–1035. <https://doi.org/10.1177/0956797616645673>, at p. 1027.

⁴¹ Davey, C. G., Allen, N. B., Harrison, B. J., Dwyer, D. B., & Yücel, M. (2010). Being liked activates primary reward and midline self-related brain regions. *Human brain mapping*, 31(4), 660–668. <https://doi.org/10.1002/hbm.20895>

⁴² Kim, S. H., Baik, S. H., Park, C. S., Kim, S. J., Choi, S. W., & Kim, S. E. (2011). Reduced striatal dopamine D2 receptors in people with Internet addiction. *Neuroreport*, 22(8), 407–411. <https://doi.org/10.1097/WNR.0b013e328346e16e>

right putamen. This finding contributes to the understanding of neurobiological mechanism of Internet addiction.”⁴³

- vi. I am familiar with the work of Eva Telzer, whom I understand to be an expert witness for plaintiffs in this litigation and will testify to her own research and findings. Eva Telzer and colleagues have shown that addiction-like social media use (ASMU) at baseline in adolescents is associated with decreased sensitivity to positive social media cues two years later, consistent with the development of tolerance, the result of neuroadaptation as described.⁴⁴ Like with other addictive substances and behaviors, the more we expose our brains to a reinforcing stimulus, the more likely we are to develop tolerance to that stimulus, needing more of it in more potent forms to get the same effect. “Within a longitudinal design, 103 adolescents completed a social incentive delay task during 1–3 fMRI scans (6–9th grade), and a 4th self-report assessment of ASMU and depressive symptoms ~2 years later (10–11th grade). We assessed ASMU effects on brain responsivity to positive social feedback across puberty and relationships between brain responsivity development, ASMU symptoms, and depressive symptoms while considering gender effects. Findings demonstrate decreasing responsivity, across puberty, in the ventral media prefrontal cortex, medial prefrontal cortex, posterior cingulate cortex, and right inferior frontal gyrus associated with higher ASMU symptoms over 2 years later.”⁴⁵
- g. The risk of addiction, including to social media, increases with easier access, a larger quantity, higher potency, more novelty, and an element of uncertainty (gamblification).
- i. Access (How Easy): Decades of addiction research have shown that when an addictive substance or behavior is more readily available, more people use it and more people get addicted to it.⁴⁶ Not everyone who is exposed to an addictive substance or behavior will develop addiction, but a consistent subset of the population will. Some individuals, including youth, are more vulnerable than others.

⁴³ Kim, S. H., Baik, S. H., Park, C. S., Kim, S. J., Choi, S. W., & Kim, S. E. (2011). Reduced striatal dopamine D2 receptors in people with Internet addiction. *Neuroreport*, 22(8), 407–411. <https://doi.org/10.1097/WNR.0b013e328346e16e>, at p. 407.

⁴⁴ Flannery, J. S., Burnell, K., Kwon, S. J., Jorgensen, N. A., Prinstein, M. J., Lindquist, K. A., & Telzer, E. H. (2024). Developmental changes in brain function linked with addiction-like social media use two years later. *Social cognitive and affective neuroscience*, 19(1), nsae008. <https://doi.org/10.1093/scan/nsae008>

⁴⁵ Flannery, J. S., Burnell, K., Kwon, S. J., Jorgensen, N. A., Prinstein, M. J., Lindquist, K. A., & Telzer, E. H. (2024). Developmental changes in brain function linked with addiction-like social media use two years later. *Social cognitive and affective neuroscience*, 19(1), nsae008. <https://doi.org/10.1093/scan/nsae008>, at p. 1.

⁴⁶ The North American opioid epidemic is a prime example of this phenomenon, and there are many others.

Defendants have made it easy for kids and teens to access their social media products with few or no guardrails, thereby increasing the risk of social media addiction in youth.

- ii. Quantity (How Much): The more the brain is exposed to an addictive substance or behavior, the higher the risk of addiction to that substance or behavior. Defendants' social media products are inherently designed to maximize quantity through design features like *endless scroll/infinite scroll* and *autoplay*, increasing the risk of addiction and other mental health harms. The inventor of infinite scroll, Aza Raskin, stated infinite scroll is one of the "behavioral design loops that create some totality of, you know, digital cocaine."⁴⁷ A report from Amnesty International on young people ages 13-24 found "a staggering 74% of respondents report checking their social media accounts more than they would like to. Respondents bemoaned the 'addictive' lure of the constant stream of notifications and targeted recommendations, often feeling 'overstimulated' and 'distracted.'"⁴⁸
- iii. Potency (How Strong): The more potent a drug or behavior, the more likely it is to be addictive.⁴⁹ Defendants' social media exploit the inherently rewarding human need for social reciprocity, social validation, and group affiliation through a rapid feedback loop of *posts, likes, shares, and comments*, enumerated at scale. The *algorithmic feed* optimizes for engagement, including time spent on the platform. Time spent, especially to the exclusion of other activities the individual could or should be doing, is one measure of the potency of social media. Just as people can develop tolerance to social media, they can also experience withdrawal, often in the form of *FOMO, fear of missing out*, another common reason young users give for staying on social media platforms longer than they want to.⁵⁰ FOMO is a dysphoric (negative) mental state consistent with negative reinforcement, i.e. engaging in a behavior to stop feeling bad, in contrast to positive reinforcement, i.e. engaging in a behavior to feel good.⁵¹ Addiction often begins with

⁴⁷ Deposition of Aza Raskin, March 17, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 71;17-75:-7.

⁴⁸ Amnesty International. (2023, February 13). "We are totally exposed": Young people share concerns about social media's impact on privacy and mental health in global survey.

<https://www.amnesty.org/en/latest/news/2023/02/children-young-people-social-media-survey-2/>

⁴⁹ NIDA. 2020, July 6. Drug Misuse and Addiction. Retrieved from <https://nida.nih.gov/publications/drugs-brains-behavior-science-addiction/drug-misuse-addiction> on 2025, March 29

⁵⁰ Alutaybi A, Al-Thani D, McAlaney J, Ali R. Combating Fear of Missing Out (FoMO) on Social Media: The FoMO-R Method. *Int J Environ Res Public Health*. 2020 Aug 23;17(17):6128. doi: 10.3390/ijerph17176128. PMID: 32842553; PMCID: PMC7504117.

⁵¹ Wise RA, Koob GF. The development and maintenance of drug addiction. *Neuropsychopharmacology*. 2014 Jan;39(2):254-62. doi: 10.1038/npp.2013.261. Epub 2013 Oct 11. PMID: 24121188; PMCID: PMC3870778.

positive reinforcement but progresses over time to negative reinforcement as the brain needs more of the substance or behavior in more potent forms and larger quantities to get the same response.

- iv. Novelty (How New): The brain's reward pathway is highly sensitive to new information and experiences.⁵² Through features like *notifications*, Defendants' social media products alert the user to new posts, thereby promoting ongoing engagement or re-engagement with the product, even when the user has directed their attention elsewhere. Notifications function as Pavlovian cues (conditioned stimulus) that perpetuate the addiction cycle by creating the anticipation of reward (unconditioned stimulus) that drives the motivation to get the drug or engage in the behavior.⁵³ Conditioned cues release dopamine in the brain's reward pathway in anticipation of future reward, setting up the cycle of anticipation, withdrawal, and craving that leads to addiction.⁵⁴
- v. Uncertainty (How Likely): Studies indicate that uncertain rewards are more reinforcing than certain rewards.⁵⁵ By definition, gambling relies on uncertain rewards.⁵⁶ Defendants' social media products create uncertain rewards through design features such as the *mystery of the algorithm*, *ephemeral content*, and unpredictable awards, thereby gamblifying social media and contributing to the increased risk of social media addiction.
- h. Children and adolescents are especially vulnerable to the addictive nature of social media because of their sensitivity to social cues and their preference for short term, risky rewards.
- i. Adolescents are sensitive to social cues. From an evolutionary perspective this makes sense: Adolescence is the time to search for and find reproductive partners. In experimental paradigms, adolescents

⁵² Costa, V. D., Tran, V. L., Turchi, J., & Averbeck, B. B. (2014). Dopamine modulates novelty seeking behavior during decision making. *Behavioral Neuroscience*, 128(5), 556–566. <https://doi.org/10.1037/a0037128>

⁵³ Robinson, M. J., Anselme, P., Fischer, A. M., & Berridge, K. C. (2014). Initial uncertainty in Pavlovian reward prediction persistently elevates incentive salience and extends sign-tracking to normally unattractive cues. *Behavioural brain research*, 266, 119–130. <https://doi.org/10.1016/j.bbr.2014.03.004>;

⁵⁴ Schultz, W., Dayan, P., & Montague, P. R. (1997). A neural substrate of prediction and reward. *Science* (New York, N.Y.), 275(5306), 1593–1599. <https://doi.org/10.1126/science.275.5306.1593>;
See Haugen_00010114 at Haugen_00010127.

⁵⁵ Shen, L., Fishbach, A., & Hsee, C. K. (2015). The motivating-uncertainty effect: Uncertainty increases resource investment in the process of reward pursuit. *Journal of Consumer Research*, 41(5), 1301–1315. <https://doi.org/10.1086/679418>

⁵⁶ Linnet, J., Thomsen, K. R., Møller, A., & Callesen, M. B. (2010). Event frequency, excitement and desire to gamble, among pathological gamblers. *International Gambling Studies*, 10(2), 177–188. <https://doi.org/10.1080/14459795.2010.502181>

show heightened responses to positive and negative social feedback.⁵⁷ After experiencing negative social feedback, teens report a greater drop in mood and more anxiety than adults.⁵⁸

- ii. Social evaluation situations in adolescents cause a greater stress response (heightened response in the autonomic nervous systems as indexed by skin conductance) than in adults, and more feelings of self-consciousness.⁵⁹ While ostensibly being viewed by a peer in a live video feed, adolescents self-reported rapidly rising embarrassment which was correlated with distinct changes in brain imaging in key structures for integrating emotional and social information.⁶⁰ This response “drastically” increased during adolescence and subsided into adulthood.⁶¹
- iii. At the same time that teenagers have a fine-tuned sensitivity for social cues, the prefrontal cortex, essential for regulating and tempering appetites and impulses, is still not fully connected to the subcortical emotion processing centers of the brain that drive appetite and impulses. Hence, teenagers are less able to exert cognitive or emotional control, especially in socially salient situations. Teens are more inclined to engage in risky behaviors, which has been linked to the mesolimbic system, including the ventral striatum, a key nucleus in the brain’s reward circuitry.⁶² Teens experience an influx of pubertal hormones which themselves have an impact on neurotransmitters and circuits, especially those involved in socio-affective response and regulation.⁶³

⁵⁷ Somerville, L. H. (2013). The Teenage Brain: Sensitivity to Social Evaluation. *Current Directions in Psychological Science*, 22(2), 121–127. <https://doi.org/10.1177/0963721413476512>

⁵⁸ Somerville, L. H. (2013). The Teenage Brain: Sensitivity to Social Evaluation. *Current Directions in Psychological Science*, 22(2), 121–127. <https://doi.org/10.1177/0963721413476512>

⁵⁹ Somerville, L. H. (2013). The Teenage Brain: Sensitivity to Social Evaluation. *Current Directions in Psychological Science*, 22(2), 121–127. <https://doi.org/10.1177/0963721413476512>, at p. 124.

⁶⁰ Somerville, L. H. (2013). The Teenage Brain: Sensitivity to Social Evaluation. *Current Directions in Psychological Science*, 22(2), 121–127. <https://doi.org/10.1177/0963721413476512>, at p. 124.

⁶¹ Somerville, L. H. (2013). The Teenage Brain: Sensitivity to Social Evaluation. *Current Directions in Psychological Science*, 22(2), 121–127. <https://doi.org/10.1177/0963721413476512>, at p. 124.

⁶² Bjork, J. M., Knutson, B., Fong, G. W., Caggiano, D. M., Bennett, S. M., & Hommer, D. W. (2004). Incentive-elicited brain activation in adolescents: similarities and differences from young adults. *The Journal of neuroscience : the official journal of the Society for Neuroscience*, 24(8), 1793–1802. <https://doi.org/10.1523/JNEUROSCI.4862-03.2004>

⁶³ Shaw, P., Kabani, N. J., Lerch, J. P., Eckstrand, K., Lenroot, R., Gogtay, N., Greenstein, D., Clasen, L., Evans, A., Rapoport, J. L., Giedd, J. N., & Wise, S. P. (2008). Neurodevelopmental trajectories of the human cerebral cortex. *The Journal of neuroscience : the official journal of the Society for Neuroscience*, 28(14), 3586–3594. <https://doi.org/10.1523/JNEUROSCI.5309-07.2008>; Somerville, L. H., Hare, T., & Casey, B. J. (2011). Frontostriatal maturation predicts cognitive control failure to appetitive cues in adolescents. *Journal of cognitive neuroscience*, 23(9), 2123–2134. <https://doi.org/10.1162/jocn.2010.21572>

- iv. Evidence shows that just like with drugs and alcohol, the earlier a child is exposed to social media, the more likely they are to develop social media addiction.⁶⁴
- i. I am familiar with the National Academies of Sciences, Engineering, and Medicine (NASEM) 2024 report, entitled, “Social Media and Adolescent Health.”⁶⁵ NASEM reports contribute to scientific knowledge, and each NASEM Report is the result of a particular committee at a particular point in time and must be considered on its own merits. Certain aspects of the NASEM 2024 Report are pertinent to my opinions in this case, as set forth below.
 - i. The NASEM Report includes an important summary that supports my opinion that Defendants’ social media products are designed to be addictive, and that such product designs are part of the revenue-generating business model: “Social media include a broad range of features that facilitate social interaction online; platforms vary widely in their target audiences, purposes, and design. For this reason, it is important to understand platform features, often called affordances, and how they interact with different developmental stages. Some affordances are powered by computational algorithms, a set of instructions that a program follows to solve a problem or perform a task. Algorithms are used for generating recommendations and determining the rank in which content is displayed, for targeting ads, and for content moderation. *In a larger sense, algorithms, which are generally proprietary, serve the end goals of keeping users engaged for as long as possible and generating revenue.*”⁶⁶
 - ii. The 2024 NASEM Report also highlights that Defendants’ efforts to attribute harmful effects to “content,” as opposed to product design, are unpersuasive, in that the addictive design is a significant reason why the platforms are harmful: “There are several ways in which platform algorithms can influence health. *While an algorithm may be innocuous, the way it presents content can be harmful, with more sensational and provocative posts given higher priority in users’ feeds, especially if the user has responded to a similar type of post in the past. This practice has the potential to create distortions and give rise to recursive feedback loops.* Recursive feedback can, in turn, exacerbate problems

⁶⁴ Schou Andreassen, C., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., & Pallesen, S. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. *Psychology of addictive behaviors : journal of the Society of Psychologists in Addictive Behaviors*, 30(2), 252–262. <https://doi.org/10.1037/adb0000160>

⁶⁵ National Academies of Sciences, Engineering, and Medicine. 2024. *Social media and adolescent health*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/27396>.

⁶⁶ National Academies of Sciences, Engineering, and Medicine. 2024. *Social media and adolescent health*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/27396>, at p. 2. (emphasis added)

with harmful content and misinformation. Recursive feedback can also promote any number of fringe views from unscientific health treatments to conspiracy theories.”⁶⁷

- iii. The NASEM Report appears to recognize the existence of the condition of Social Media Use Disorder, as either an independent diagnosis or part of the same condition as Internet gaming disorder: “Heavy users of online video games can develop a dysfunctional behavior related to games, characterized by a persistent pattern of impaired control over the need to play, to the point where gaming takes precedence over all other life activities. Given that gaming disorder is defined by dysfunction, it is not surprising that many studies find evidence that the disorder predicts depression, anxiety, social phobia, poor school performance, sleep disruption, and poor relationships with parents and peers. Although less well studied, a dysfunctional use of social media appears to be a similar problem. *It is currently unclear whether problematic social media use and gaming disorder are distinct disorders or are simply different manifestations of a similar disordered use of technology.*”⁶⁸
- iv. The NASEM report states that the literature does not support the conclusion that social media are harmful “at the population level.”⁶⁹ However, that conclusion is undermined by the other statements excerpted above, which do support that conclusion.
- v. Finally, the 2024 NASEM Report has been criticized for its inadequate public health presentation on the Committee, as well as its inclusion of members with financial ties to industry: “What was equally surprising was that NASEM appointed two experts to this committee who had received funding from industry. [Citations omitted]. These conflicts of interest reduce the integrity of the committee and the report it was charged with writing. Those trained in public health, especially those in tobacco control, alcohol prevention, nutrition, and gun violence prevention, are familiar with the importance of qualifying research from industry-funded scientists. The conclusions and recommendations found in the report should be considered with these committee members’ conflicts of interest in mind. For decades, industry-funded research has muddied the waters of the scientific literature, casting doubt on the harms to society caused by tobacco, guns, and alcohol.

⁶⁷ National Academies of Sciences, Engineering, and Medicine. 2024. Social media and adolescent health. Washington, DC: The National Academies Press. <https://doi.org/10.17226/27396>, at pp. 2-3. (emphasis added)

⁶⁸ National Academies of Sciences, Engineering, and Medicine. 2024. Social media and adolescent health. Washington, DC: The National Academies Press. <https://doi.org/10.17226/27396>, at p. 6. (emphasis added)

⁶⁹ National Academies of Sciences, Engineering, and Medicine. 2024. Social media and adolescent health. Washington, DC: The National Academies Press. <https://doi.org/10.17226/27396>, at p. 5.

Those trained in schools of public health are often taught about the lengths the tobacco, firearm, and alcohol industries have gone to discredit public health research. To accomplish this, each industry has funded research and researchers to produce studies that contradict (i.e., sow doubt about) the prevailing evidence on a topic area. The ability to sow doubt has cascading effects on public opinion and agenda setting at the legislative level. Therefore, NASEM committees charged with understanding and summarizing issues of public concern, and with providing recommendations for (in)action by the government, should be free of members with conflicts of interest.”⁷⁰

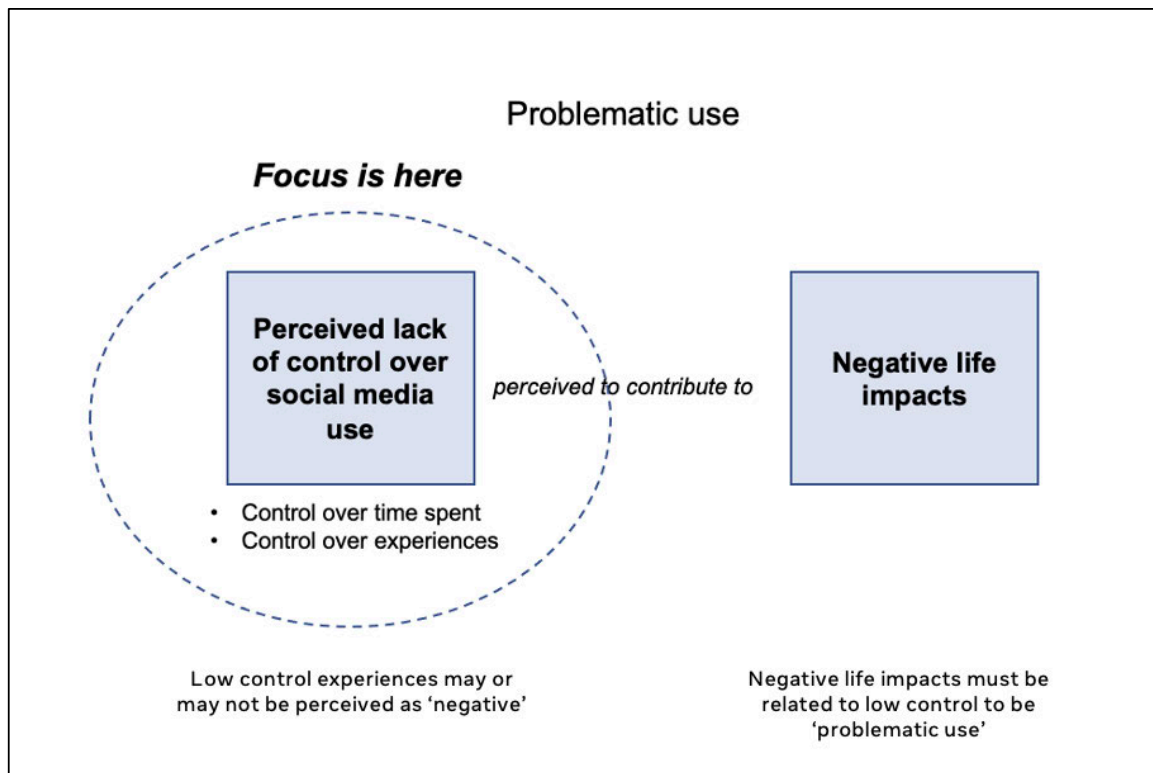
4. Defendants exploit behavioral reward mechanisms with their addictive and unsafe social media products targeted at kids. Defendants’ own documents provide evidence that their social media products are addictive.

- a. **Meta** exploits behavioral reward mechanisms with its addictive and unsafe social media products targeted at kids.
 - i. Meta’s internal definition of “Problematic Use (PU)” aligns closely with accepted definitions of social media addiction. A Meta presentation from 2023 elaborates on Meta’s definition of “Problematic Use” as follows: “A perceived lack of control over usage of a technology or social media platform *and* this lack of control is perceived to lead to negative life impacts (e.g., in domains such as relationships, work/school, sleep, etc).”⁷¹ See figure⁷² below for a graphic of Meta’s definition of Problematic Use:

⁷⁰ Allem J. P. (2024). Social Media and Adolescent Health. American journal of public health, 114(10), 980–982. <https://doi.org/10.2105/AJPH.2024.307784>, at p. 980.

⁷¹ META3047MDL-050-00215087 at *17 (produced natively).

⁷² META3047MDL-050-00215087 at *17 (produced natively).



- ii. Meta’s definition includes room for lack of awareness of addictive symptoms: “Low control experiences may or may not be perceived as ‘negative.’”⁷³ Similarly, ASAM states addiction is characterized by “diminished recognition of significant problems with one’s behaviors and interpersonal relationships.”⁷⁴
- iii. Meta’s definition of Problematic Use also acknowledges multiple adverse life impacts as “related to low control,”⁷⁵ drawing a causal connection between problematic, addictive use, and negative life consequences.
- iv. An Internal Meta study of problematic Facebook use, entitled, “Understanding Perceptions of Problematic Facebook Use,” used the

⁷³ META3047MDL-050-00215087 at *17 (produced natively).

⁷⁴ American Society of Addiction Medicine. (2011. August 15). Public Policy Statement: Short Definition of Addiction. https://web.archive.org/web/20181007192411/https://www.asam.org/docs/default-source/public-policy-statements/1definition_of_addiction_short_4-11.pdf?sfvrsn=6e36cc2_0

⁷⁵ META3047MDL-050-00215087 at *17 (produced natively).

“Bergen Social Media Addiction Scale,”⁷⁶ lending further credibility to the idea that Meta’s “Problematic Use” is synonymous with social media addiction. Specifically, the Bergen Scale “was developed on the basis of the addiction theory, which measures addiction through six core components: salience, tolerance, mood modification, relapse, withdrawal, and conflict...”⁷⁷

- v. In sum, in my opinion, Meta’s definition and usage of “Problematic Use” is closely akin, if not equivalent, to social media addiction.
- vi. Access (How Easy):
 - A. Meta has made it easy for young users to access their social media content. Anyone at any age, including kids under the age of 13, can create a Facebook or Instagram account by providing an incorrect birthdate as there is no age verification process.⁷⁸
 - B. Facebook’s own internal documents attest to the easy accessibility of its rewards as follows: “Facebook’s rewards are easily accessible, available all the time, limitless, and don’t include built-in controls. For people who tend to have difficulty regulating their consumption of rewards, it may be easy to use Facebook too much.”⁷⁹
 - C. Instagram’s internal documents describe teens as “an IG [Instagram] priority audience” and state “16% of creators in the total addressable market ... are teens.”⁸⁰
- vii. Quantity (How Much):
 - A. Meta’s social media products include numerous design features that increase quantity, for example endless scroll and autoplay.

⁷⁶ Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3290605.3300429>

⁷⁷ Danish Competition and Consumer Authority. (2025). Young consumers and social media. <https://www.em.dk/Media/638744252848589136/KFST%20analyse%20-%20Young-consumers-and-social-media.pdf>, at p. 23.

⁷⁸ Gold, A. (2023, March 6). Tech platforms struggle to verify their users’ age. Axios. <https://www.axios.com/2023/03/06/age-checks-online-children-social-media-privacy>; See META3047MDL-034-00037237 at META3047MDL-034-00037258.

⁷⁹ META3047MDL-020-00563113 at META3047MDL-020-00563136,

⁸⁰ META3047MDL-136-00013164 at META3047MDL-136-00013200.

- B. A Meta internal document describes why consumers “spend more time than [they’d] like on Instagram/FB/Oculus,” noting the “Infinite scroll, auto-play videos, losing track of time.” With autoplay, one video rolls directly into the next, such that the user has to do work to *stop* using, rather than the other way around.⁸¹
- C. As one Facebook user reported, “I lose track of time. Especially with the videos. Wow, I spend a lot of time on the videos because they start automatically and when I realize it, I’m already watching.”⁸²
- D. An internal Instagram document on targeting addictive use of social media cites “Overall amount of time spent,” as a key feature of problematic use.⁸³ An email to Head of Instagram Adam Mosseri stated that Instagram’s “overall goal remains total teen time spent.”⁸⁴ Meta CEO Mark Zuckerberg admitted that Meta set specific goals for time spent on their platforms, contrary to his statements to Congress denying this fact.⁸⁵
- E. A study by Shakya and Christakis found a clear link between time spent on Facebook use and worsened mental health, based on objective measures of Facebook engagement, i.e. “the number of Facebook friends they had (‘friend count’), the number of times in their history of Facebook use that they had clicked ‘like’ on someone else’s content (‘lifetime like count’), the number of links they had clicked in the past 30 days (‘30-day link count’), and the number of times they had updated their status in the past 30 days (‘status count’).”⁸⁶ The authors concluded that it is not the content per se but the sheer amount of time spent on Facebook that creates the harm, including opportunity costs, that is, decreased engagement in healthy activities due to time spent on Facebook: “... our models cannot identify the mechanisms by which Facebook use may lead to reduced well-being. Although ‘liking’ other people’s content could be reflective of attention to other’s

⁸¹ META3047MDL-087-00030017 at META3047MDL-087-00030041

⁸² META3047MDL-087-00030017 at META3047MDL-087-00030041.

⁸³ META3047MDL-136-00013164 at META3047MDL-136-00013181.

⁸⁴ META3047MDL-014-00305741.

⁸⁵ Deposition of Mark Zuckerberg, Volume I, March 27, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 171:12-194:8.

⁸⁶ Shakya, H. B., & Christakis, N. A. (2017). Association of Facebook Use With Compromised Well-Being: A Longitudinal Study. *American journal of epidemiology*, 185(3), 203–211. <https://doi.org/10.1093/aje/kww189>, at p. 205.

positive posts, which could lead to negative self-comparison, updating one's own status and clicking links would seem to suggest that the relationships we found are simply a matter of quantity of use. If this is the case, our results are in contrast to those from previous research asserting that the quantity of social media interaction is irrelevant and that only the quality of those interactions matter. *Large quantities of social media interaction may indeed detract from more meaningful real life experiences.*"⁸⁷

viii. Potency (How Strong):

- A. Meta's social media products include many features that contribute to its interactive potency, such as *posts, likes, shares, and comments*, enumerated at scale.
- B. Meta's own researchers, Justin Cheng, Moira Burke, and Elena Goetz Davis, performed an internal Facebook Study, "Understanding Perceptions of Problematic Facebook Use," in which they paired "a survey of 20,000 Facebook users in the U.S. measuring perceived problematic Facebook use with server logs of aggregated behavioral data for the previous four weeks, such as the amount of time respondents spent on the site and counts of interactions with close friends."⁸⁸ They found that 3.1% of Facebook users developed severe social media addiction,⁸⁹ while an internal document reported an additional finding that 55% of Facebook users developed mild social media addiction.⁹⁰
- C. Of note here, the authors found that, "[c]ontrary to stereotypes of people scrolling through endless content, people who experience problematic use spend proportionally less time in Their News Feeds and more time browsing profiles, and

⁸⁷ Shakya, H. B., & Christakis, N. A. (2017). Association of Facebook Use With Compromised Well-Being: A Longitudinal Study. *American journal of epidemiology*, 185(3), 203–211. <https://doi.org/10.1093/aje/kww189>, at p. 210 (emphasis added).

⁸⁸ Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. <https://doi.org/10.1145/3290605.3300429>.

⁸⁹ Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. <https://doi.org/10.1145/3290605.3300429>.

⁹⁰ META3047MDL-053-00028484.

message others more frequently.”⁹¹ This illustrates the interactive nature of Facebook as central to its reinforcing properties.

- D. Highlighting the reward expectation loop of Meta’s addictive products, the authors describe that “people experiencing problematic use...sent 62.7% more messages than those who are not experiencing problematic use ($d = 0.20$, $p < 0.001$) (Figure 3d), despite spending only 21.6% more time overall on Facebook. Normalizing by the amount of time spent on the site, they sent 38.7% more messages per hour ($d = 0.19$, $p < 0.001$). They were also 36.7% more likely to have sent more messages than they received ($d = 0.19$, $p < 0.01$).”⁹²

ix. Novelty (How New):

- A. Meta’s social media products rely on features like *notifications* to draw the user back into using the social media product when their attention is elsewhere.
- B. Meta’s own researchers describe the impact of notifications as follows: “Notifications may prompt people to use Facebook at times when they wouldn’t have otherwise, thus reducing feelings of control by interrupting other tasks or in-person social interactions. In prior work, interruptions slow task completion [25], inhibit performance on complex tasks [85], and make it difficult to return to a previously interrupted task [70]. Previous research also found that notifications can cause inattention and hyperactivity, which in turn decreases productivity and subjective well-being [58].”⁹³
- C. Facebook’s internal researchers noted that “Problematic Users found it incredibly difficult avoiding notifications compared to those without PU [problematic use]”;⁹⁴ and “The majority

⁹¹ Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3290605.3300429>.

⁹² Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3290605.3300429>.

⁹³ Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3290605.3300429>.

⁹⁴ META3047MDL-087-00030017 at META3047MDL-087-00030042.

intended to have a quick look, but would get hooked by something on FB, losing all track of time.”⁹⁵

- D. One Facebook user surveyed by FB said, “Red dots are toxic on the home screen.”⁹⁶ Red dots are a form of notification.
- E. Instagram internal documents described “frequent checking,” including “clearing of notifications,” as a key aspect of Instagram Problematic Use (PU).⁹⁷ The document further described that 42% (74 million) global teens struggle with frequent checking and clearing of notification,⁹⁸ and “21% of US teen WAU [Weekly Active Users] say notifications make it harder for them to manage the amount of time they spend on the app, and 32% say the number of notifications they receive can be overwhelming.”⁹⁹
- F. “People reporting problematic use [of Facebook] received 27.4% more notifications than people who did not report problematic use ($d = 0.15$, $p < 0.05$), and responded to a greater fraction of these notifications ($d = 0.18$, $p < 0.01$, Figure 3e, Research Question 4). In particular, they were more likely to respond to notifications when they were about replies to comments they had made ($d = 0.18$, $p < 0.05$).”¹⁰⁰ This again highlights the role of notifications in social media addiction.
- G. Facebook users who deactivate their Facebook accounts, a potential proxy for those struggling with addictive, problematic use, both receive more notifications than the average user, and also respond to them faster.¹⁰¹ The fact that some users may deactivate their Facebook accounts does not negate the fact that a substantial population of users is incapable of doing so, due to the addictive nature and design of the platform.

⁹⁵ META3047MDL-087-00030017 at META3047MDL-087-00030043.

⁹⁶ META3047MDL-087-00030017 at META3047MDL-087-00030041.

⁹⁷ META3047MDL-136-00013164 at META3047MDL-136-00013213.

⁹⁸ META3047MDL-136-00013164 at META3047MDL-136-00013213.

⁹⁹ META3047MDL-136-00013164 at META3047MDL-136-00013213.

¹⁰⁰ Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3290605.3300429>.

¹⁰¹ Haugen_00016893 at Haugen_00016900.

- x. Uncertainty (How Likely):
- A. Meta’s social media algorithm provides just enough uncertainty, also known as intermittent positive reinforcement, to encourage ongoing engagement in the hope of future reward.¹⁰² Meta has called the unpredictable nature of social media products the *mystery of the algorithm*.¹⁰³ Unpredictable rewards are more rewarding than predictable ones, which is why social media products can be likened to slot machines in a casino.
 - B. Instagram internal documents specifically use the language of slot machines, noting their “pull to refresh” feature wherein, like pulling on a slot machine, users refresh the entire app to see what images and videos are newly suggested. Meta describes this as “Slot machine effect pull down to refresh.”¹⁰⁴
 - C. Meta employee ██████ commented on a post by Meta’s ██████ on “reasons why increasing user-engagement might not increase user value,”¹⁰⁵ which noted, “(3) Self Control Problems...Finally there are sometimes discrepancies between what people choose and what gives them the most value...There are reasons to worry about self-control and use of our products. I think the biggest problems people have are: (1) compulsive use, to fill gaps in their time, and they end up spending more time than they’d like, instead of spending time with their families, or studying; (2) unhealthy fixating on other people – most prototypically, compulsively looking up the profile of your ex-partner.”¹⁰⁶ ██████ commented “A lot of (3) sounds like addiction. Addiction (as I was taught!) is characterized by a dissociation between ‘liking’ and ‘wanting.’ The addict self-reports that they do drugs because they like it, but generally it can be revealed that addicts don’t like the drug as much as they used to, before they were addicted. However they want it more, and compulsively seek it, despite suffering harm. Mapping to Tom’s thinking here, wanting can be proxied by engagement, but liking is more like the value we’re after. These dissociate all the time, [sic] and it can happen to anyone. Addiction is

¹⁰² Robinson, M. J., Anselme, P., Fischer, A. M., & Berridge, K. C. (2014). Initial uncertainty in Pavlovian reward prediction persistently elevates incentive salience and extends sign-tracking to normally unattractive cues. *Behavioural brain research*, 266, 119–130. <https://doi.org/10.1016/j.bbr.2014.03.004>

¹⁰³ META3047MDL-087-00030017 at META3047MDL-087-00030041.

¹⁰⁴ META3047MDL-047-01167629 at META3047MDL-047-01167637, META3047MDL-047-01167742.

¹⁰⁵ Haugen_00010114

¹⁰⁶ Haugen_00010114 at Haugen_00010119.

challenging to define, and usually refers to behavior that persists despite adverse consequences. It seems clear from what's presented here that some of our users are addicted to our products. And I worry that driving sessions incentivizes us to make our product more addictive, without providing much more value. How to keep someone returning over and over to the same behavior each day? Intermittent rewards are most effective (think slot machines), reinforcing behaviors that become especially hard to extinguish – even when they provide little reward, or cease providing reward at all.”¹⁰⁷

- xi. Meta's internal documents attest to the addictive nature of these and other interactive design features as depicted in the figure below:¹⁰⁸

Current PU Experience

We heard about 10+ triggers contributing to PU habits.

- **Notifications** – Getting too many minor/irrelevant notifications. Try to only look at important ones but get sucked into longer sessions.
- **Entertaining content** – Many said they'd open FB with a clear intent (like checking the news, a specific group, or work-related posts), then get distracted by something entertaining
- **Videos** – Easy to get immersed (especially before bedtime). Auto-play exacerbates the issue.
- **Groups** – Get exponentially more notifications, engaged in chat threads
- **Fear of missing out (FOMO)** – Worry about missing important world news or updates in their social circles.
- **Mystery of the algorithm** – Uncertainty over if they will see posts from those they want; if they can find a post again later.
- **Marketplace / Ads** – Vigilance of buyers/sellers, sales, lower resistance to purchasing at night
- **Recently post/comment** – Higher curiosity to see responses
- **Ephemeral content** (e.g. Stories, birthdays) – Catch it before it's gone
- **Boredom/free time** – Desire to fill downtime or “time pass”

Red dots are toxic on the home screen.
P4, 25-34 (m) US

People liking things can be addictive. I feel compelled to see who liked it. I think it's a bad habit because [I'm] always checking.
P2, 45-54 (m) US

The algorithm doesn't always know what I want to see. I have to do the work to find what I want to see.
P7, 35-44 (f) US

What bothers me the most is getting so entertained; I lose track of time. Especially with the videos. Wow, I spend a lot of time on the videos because they start automatically and when I realize it, I'm already watching.
P1, 29 (f) Brazil

Facebook App Research

- xii. Meta's internal slide presentation, “Facebook ‘Addiction’: A response to the public narrative based on clinical and neuroscience research,” by Elena Davis, dated June 2018,¹⁰⁹ tries to make an unpersuasive distinction between habits and addiction to minimize the harms of problematic Facebook use.

¹⁰⁷ Haugen_00010114 at Haugen_00010127.

¹⁰⁸ META3047MDL-087-00030017 at META3047MDL-087-00030041.

¹⁰⁹ META3047MDL-020-00563113

- A. Davis identifies design features that contribute to addictive use, such as “notifications with little or no relevance” (novelty/cue-induced cravings), “continuous content without breaks” (quantity/forced abundance), “constant updates including Like counts” (potency through quantified social validation), “lack of feedback about amount of use” (quantity/no natural stopping point), and “signals of availability that lead to expectations of quick responses (immediate gratification and expectancy of reward).”¹¹⁰
- B. Davis acknowledges that “Facebook may be rewarding and habit-forming. Therefore some people may experience genuine problems related to their Facebook use. We should reduce cases where rewards are unpredictable or lacking value, and reduce unintentional behavior, for example.”¹¹¹ The document then lists these features: “notifications with little or no relevance, continuous content without breaks, constant updates including Like counts, lack of feedback about amount of use, signals of availability that lead to expectations of quick responses.”¹¹²
- C. Simply replacing the word ‘addictive’ with the word ‘habit-forming,’ however, does not change the phenomenon. The core definitional feature of addiction is repetitive, ‘habitual’ behaviors that cross over to harmful behaviors. As stated in this “Facebook ‘Addiction’” presentation, “some people may experience genuine problems related to their Facebook use,”¹¹³ and that includes the problem of addictive use.
- D. Davis goes on to say, “Facebook’s rewards are easily accessible, available all the time, limitless, and don’t include built-in controls. For people who tend to have difficulty regulating their consumption of rewards, it may be easy to use Facebook too much.”¹¹⁴ I agree, which is exactly how Facebook designed it, a frictionless interface where it’s ‘easy to use too much,’ creating the problem of Facebook addiction. Whether you call it ‘habit-forming,’ which tends to minimize harms, or ‘addictive,’ which acknowledges the extent of those harms in some cases, this “Facebook ‘Addiction’” document should

¹¹⁰ META3047MDL-020-00563113 at META3047MDL-020-00563116.

¹¹¹ META3047MDL-020-00563113 at META3047MDL-020-00563116.

¹¹² META3047MDL-020-00563113 at META3047MDL-020-00563116.

¹¹³ META3047MDL-020-00563113 at META3047MDL-020-00563116.

¹¹⁴ META3047MDL-020-00563113 at META3047MDL-020-00563136.

have been a call to action to change the design features which contribute to those harms.

- E. Davis' "Facebook 'Addiction'" presentation relies on a similar definition of addiction, attributed to similar sources, as I do in this Report, stating for example that, "Addiction involves a broad set of long-lasting changes to brain circuitry underlying reward, stress, and self-control. The major brain change is that the dopamine system becomes less sensitive,"¹¹⁵ and noting that "Impairment can be in social, occupational, or other life domains."¹¹⁶ On a slide entitled "If Facebook 'addiction' were a diagnosis, criteria might include: Multiple symptoms...Examples: Preoccupying thoughts: thoughts about Facebook use are excessive, absorbing, and irresistible[.] Overwhelming behavior: drive to use Facebook is extremely strong, despite desire and/or attempts to stop[.] 'Tolerance': more and more use is needed to achieve desired feelings...Persistence over time[.] Use continues despite significant negative life impacts[.] Problematic symptoms are not limited to unique or temporary circumstances...Negative life impacts[.] Facebook use has caused significant negative impacts on important areas of life functioning, e.g., loss of job or relationships[.] Other important interests are neglected in favor of Facebook use[.]"¹¹⁷ Meta's own documents are rife with examples of "Facebook addiction."
- F. Davis makes the unsupported claim that "Facebook is not a substance that acts directly on the brain. It does not create brain changes at the level of intoxication or impairment. The rewards that Facebook produces are naturalistic (i.e. social), not chemical."¹¹⁸ As detailed in this Report, people can get addicted to behaviors as well as substances, which means that behaviors too can 'create brain changes at the level of intoxication or impairment.' Indeed, the brain is *the* bodily organ on which Facebook and Instagram act.
- G. Davis also makes the unsupported claim, "There is no evidence of dopamine system abnormalities related to Facebook use."¹¹⁹ As described above, social rewards trigger the same

¹¹⁵ META3047MDL-020-00563113 at META3047MDL-020-00563121.

¹¹⁶ META3047MDL-020-00563113 at META3047MDL-020-00563122.

¹¹⁷ META3047MDL-020-00563113 at META3047MDL-020-00563123.

¹¹⁸ META3047MDL-020-00563113 at META3047MDL-020-00563124.

¹¹⁹ META3047MDL-020-00563113 at META3047MDL-020-00563124.

reward pathway as drugs and alcohol and social media addiction leads to similar brain changes as drug and alcohol addiction. Flannery et al.¹²⁰ have shown tolerance to social media. The Kim et al. (2011) study supports changes to the dopaminergic system with “internet addiction.” While it is not specific to Facebook, there is no valid reason to exclude Facebook use from the umbrella term of “internet addiction.”

- H. Davis makes the unsubstantiated claim, “Facebook does likely activate dopamine,” but “The degree of dopamine release from behaviors is not as extreme as from substances.”¹²¹ To my knowledge there is no evidence showing how much dopamine Facebook releases relative to substances or other behaviors. It might be less, but it also might be more. While the diagnosis of addiction is not based on how much dopamine is released (but rather on the manifestation of harmful behaviors caused by compulsive overuse), this very presentation cites to studies showing changes in the brain’s reward pathway in response to social media, changes that are known to be mediated by dopamine: “1. Instagram pictures with more vs. fewer ‘Likes’ activate the ventral striatum (VS) to a greater extent[.] This means Like counts provide meaningful information for whether something is important and potentially rewarding. 2. Images of Facebook symbols (e.g., the “F”) activate the VS more for frequent users[.] If you use Facebook often, common symbols produce reward system activation; also those symbols will be more familiar to you and therefore more salient. 3. People who have stronger VS responses to reputation gains as compared to monetary gains are more likely to use Facebook more[.] People who are particularly sensitive to social rewards might find Facebook use more rewarding and therefore use it more.”¹²² This slide

¹²⁰ Flannery, J. S., Burnell, K., Kwon, S. J., Jorgensen, N. A., Prinstein, M. J., Lindquist, K. A., & Telzer, E. H. (2024). Developmental changes in brain function linked with addiction-like social media use two years later. *Social cognitive and affective neuroscience*, 19(1), nsae008. <https://doi.org/10.1093/scan/nsae008>

¹²¹ META3047MDL-020-00563113 at META3047MDL-020-00563124.

¹²² META3047MDL-020-00563113 at META3047MDL-020-00563131.

cites to Sherman et al., 2016; 2018,¹²³ Turel et al., 2014,¹²⁴ and Meshi et al., 2013.¹²⁵

- I. Davis asserts “A Facebook addiction diagnosis would require a fairly high threshold of severity and inability to control use despite serious negative life impacts. It is unlikely that most people would meet this threshold when it comes to Facebook.”¹²⁶ I would agree that making a diagnosis of addiction requires a threshold of severity, which has been described based on validated measures like the Social Media Disorder Scale. I also agree that “it is unlikely that *most* people would meet this threshold.”¹²⁷ But most people who drink alcohol, use drugs, or gamble, also do not meet threshold criteria for addiction. Lifetime prevalence of addiction to drugs is approximately 17%.¹²⁸ According to Facebook’s own research, 3.1% of Facebook users are severely addicted to Facebook,¹²⁹ amounting to 93 million¹³⁰ Facebook users seriously harmed. As noted above, Meta’s own documents acknowledge a much higher proportion of 55% of users with “mild” addiction.
- J. Davis describes how “The negative emotion itself could become a trigger for use - so there would be constant real life (non-Facebook) cues that could drive someone to use too much.”¹³¹ I agree. People experiencing negative emotions are more

¹²³ Sherman, L. E., Greenfield, P. M., Hernandez, L. M., & Dapretto, M. (2018). Peer influence via Instagram: Effects on brain and behavior in adolescence and young adulthood. *Child Development*, 89, 37-47; Sherman, L. E., Payton, A. A., Hernandez, L. M., Greenfield, P. M., & Dapretto, M. (2016). The power of the like in adolescence: effects of peer influence on neural and behavioral responses to social media. *Psychological Science*, 27, 1027-1035.

¹²⁴ Turel, O., He, Q., Xue, G., Xiao, L., & Bechara, A. (2014). Examination of neural systems sub-serving Facebook “addiction”. *Psychological Reports*, 115, 675-695.

¹²⁵ Meshi, D., Morawetz, C., & Heekeren, H. R. (2013). Nucleus accumbens response to gains in reputation for the self relative to gains for others predicts social media use. *Frontiers in Human Neuroscience*, 7, 439.

¹²⁶ META3047MDL-020-00563113 at META3047MDL-020-00563126,

¹²⁷ META3047MDL-020-00563113 at META3047MDL-020-00563126

¹²⁸ Substance Abuse and Mental Health Services Administration. (2024). 2023 Companion infographic report: Results from the 2021, 2022, and 2023 National Surveys on Drug Use and Health (SAMHSA Publication No. PEP24-07-020). Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. <https://www.samhsa.gov/data/report/2021-2022-2023-nsduh-infographic>, at p.9.

¹²⁹ Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3290605.3300429>; META3047MDL-020-00230760 at META3047MDL-020-00230761.

¹³⁰ Barinka, A. (2022, October 26) Meta’s Instagram Users Reach 2 Billion, Closing In on Facebook, Bloomberg. <https://www.bloomberg.com/news/articles/2022-10-26/meta-s-instagram-usersreach-2-billion-closing-in-on-facebook>

¹³¹ META3047MDL-020-00563113 at META3047MDL-020-00563138,

vulnerable to addiction, and internal triggers are as powerful as external ones. That Facebook use might be triggered by emotional distress does not change the fact that its addictive potential is contributing to emotional distress, especially among its most vulnerable users, including children and teens, and that the emotional distress caused by Facebook is contributing to ongoing engagement with Facebook.

- K. Davis states, “Having a habit does not mean you have no agency. It does mean that effortful control is needed to inhibit your automatic behavior, and this can be difficult.”¹³² This statement seems to be making the claim that distinguishing between a habit and addiction is the difference between having agency and having no agency. I disagree. Having addiction does not mean you have *no* agency. It means you have *limited* agency. If people with addiction had no agency they would never get into recovery, and yet we know addiction is a treatable disease. Their agency is constrained by their disease corresponding to the severity. Those with mild addiction have more agency than those with severe addiction. Further, there are “powerful neurological and psychological forces”¹³³ driving both habit and addiction. In sum, the difference she attempts to draw between habit and addiction is largely semantic.
 - L. Davis acknowledges that Facebook’s design makes it difficult to break habitual behaviors.¹³⁴ “Habits can be changed by behavior regulation, but aspects of Facebook can make regulation difficult: [1]) Low awareness[;] People don’t realize how often or for how long they are using Facebook[, [2]] Low intentionality[:] Default options are kept in place Choices are not deliberate[.] [3]) Low attentiveness[:] Use of Facebook feels mindless Logging on is unconscious or automatic[.] [4]) Low control[:] It is difficult to limit one’s use It is easy to keep scrolling and go on frequently.”¹³⁵ Indeed.
- b. Other **Meta** internal documents also provide evidence that its social media products, Facebook and Instagram, lead to out-of-control use, compulsive use, continued use despite consequences, and withdrawal.

¹³² META3047MDL-020-00563113 at META3047MDL-020-00563143.,

¹³³ META3047MDL-020-00563113 at META3047MDL-020-00563143.

¹³⁴ META3047MDL-020-00563113 at META3047MDL-020-00563147.

¹³⁵ META3047MDL-020-00563113 at META3047MDL-020-00563147.

- i. Facebook conducted a qualitative study on Facebook “Problematic Use,” stating “‘problematic use sometimes called ‘social media addiction’ externally,’”¹³⁶ is characterized by “Loss of Control over Time Spent (LCOTS).”¹³⁷ The study was conducted in 2019 and included 24 in-person one on one interviews with “problematic Facebook users in the US, Brazil, and India to determine which opportunities the team should pursue around excessive, problematic use.”¹³⁸ As previously stated, Facebook’s internal definition of problematic use mirrors definitions of social media addiction.
- ii. Out of Control Use:
 - A. The Facebook Qualitative Study identifies out of control use as a feature of Problematic Use, quoting one participant, “I’m on Facebook every day, every moment. Literally, every moment; just not when I’m in the shower. It’s a habit, I just have been doing this for a few years... I lose the notion of time.”¹³⁹
 - B. Facebook researchers acknowledge Facebook’s addictive potential by citing external research in their internal presentations, such as “The best external research indicates that Facebook’s impact on people’s well-being is negative. FB can have a negative effect when people feel a lack of control over the experience or when use undermines other aspects of life.”¹⁴⁰
 - C. In a slide presentation, Elena Davis and Josh Latshaw of X-Meta Well-being described Meta’s survey of users’ perceived control of their use of Facebook and Instagram conducted between December 2022 and January 2023, in which they surveyed ~30K youth and ~30K adult users in 12 countries.¹⁴¹ They found that “Users’ perceived control can be validly measured across age cohorts with questions assessing **low attentiveness** around platform use (i.e., spending more time, checking, and consuming content without realizing it) and **low capability** to change platform use (i.e., low confidence in ability to reduce time, checking, or interactions).”¹⁴² They documented that ~31-34% of youth spend more time,

¹³⁶ META3047MDL-087-00030017 at META3047MDL-087-00030031 (See also Haugen_00016373)

¹³⁷ META3047MDL-087-00030017 at META3047MDL-087-00030018.

¹³⁸ META3047MDL-087-00030017; See also Haugen_00016373.

¹³⁹ META3047MDL-087-00030017 at META3047MDL-087-00030043.

¹⁴⁰ META3047MDL-087-00030017 at META3047MDL-087-00030022.

¹⁴¹ META3047MDL-074-00027496 at *2 (produced natively).

¹⁴² META3047MDL-074-00027496 at *2 (produced natively). (emphasis in original)

checking, and consuming Facebook content without realizing it and 19-20% of youth have low confidence in ability to reduce time, checking, or interactions on Facebook.¹⁴³ Their results link “low perceived control on FB” to specific product features, including *Stories*, *Notifications*, *News Feed*, *Reels*, and *Comments*.¹⁴⁴

- D. Similar to the Facebook platform, Meta’s survey of Instagram users’ documented that 38-39% of youth spend more time, checking, and consuming Instagram content without realizing it and 18-19% of youth have low confidence in their ability to reduce time, checking, or interactions on Instagram.¹⁴⁵ Davis and Latshaw found specific Instagram design features “associated with low perceived control of IG,” including *Explore tab*, *Stories creation*, *Reels tab*, *Direct*, *Notifications*, *Home*, and *Profile*.¹⁴⁶
- E. Davis and Latshaw concluded, “Stories usage is the strongest and most consistent predictor of low control. This may be due to content consumption affordances (like autoplay) but also about ephemerality, which may contribute to not wanting to miss updates and desire to respond to others in a timely way (consistent with social pressures, FOMO; expert input supports these hypotheses...”¹⁴⁷
- F. An Instagram internal slide presentation entitled, “E[Instagram] Mental Well-being” dated November 17, 2022, by “WB [Well-being] Leads Review,” notes that “56% of IG teens surveyed say it’s difficult to manage how much time they spend on social media and 14% say IG makes it worse,”¹⁴⁸ attesting to the addictive nature of the platform.
- G. The same presentation acknowledges that “Teens and young adults are more likely to report experiencing problematic use consistent with developmental differences in self-control.”¹⁴⁹ Further, “41% of weekly teen users say they try to limit their IG use and 22% say they want help controlling their usage,”¹⁵⁰

¹⁴³ META3047MDL-074-00027496 at *27(produced natively).

¹⁴⁴ META3047MDL-074-00027496 at *31 (produced natively). (emphasis added)

¹⁴⁵ META3047MDL-074-00027496 at *10 (produced natively).

¹⁴⁶ META3047MDL-074-00027496 at *14 (produced natively). (emphasis added)

¹⁴⁷ META3047MDL-074-00027496 at *40 (produced natively).

¹⁴⁸ META3047MDL-136-00013164 at META3047MDL-136-00013172.

¹⁴⁹ META3047MDL-136-00013164 at META3047MDL-136-00013172.

¹⁵⁰ META3047MDL-136-00013164 at META3047MDL-136-00013172.

showing how addictive social media platforms like Instagram can increase the risk of out-of-control use.

iii. Compulsive Use:

- A. A core feature of addiction is behaviors that are so automatic that we're engaging in them without realizing it and contrary to our desire to do so. The Facebook Qualitative Study corroborates the compulsive nature of Facebook, quoting one participant, "People liking things can be addictive. I feel compelled to see who liked it. I think it's a bad habit because [I'm] always checking."¹⁵¹
- B. And another participant, "I check right away when I get a notification, like a compulsion."¹⁵²
- C. On February 3, 2019, a Facebook user emailed CEO Mark Zuckerberg directly asking for help for her Facebook addiction: "Please help Hello. My name is Tamika. I joined facebook awhile ago. But I have deleted my account. I was too addicted to Facebook."¹⁵³
- D. "IG [Instagram] Mental Well-being" (2022) reporting on Instagram's own internal data describes how "23% of US teen WAU [Weekly Active Users] say they open Instagram without realizing it at least once a day (Hanko, PU foundational survey)."¹⁵⁴
- E. "27% of teen WAU across 6 countries (UK, US, NG, SK, BR, IN) report 'often' or 'very often' checking IG automatically without realizing it (Davis, PU pilot survey)."¹⁵⁵

iv. Consequential use:

- A. The Facebook Qualitative Study acknowledges many different adverse consequences as a result of Facebook addiction, stating "All problematic users were experiencing multiple life impacts," listed as "loss of productivity," "sleep disruption,"

¹⁵¹ META3047MDL-087-00030017 at META3047MDL-087-00030041.


¹⁵² META3047MDL-087-00030017 at META3047MDL-087-00030042.

¹⁵³ META3047MDL-040-00028639

¹⁵⁴ META3047MDL-136-00013164 at META3047MDL-136-00013213.

¹⁵⁵ META3047MDL-136-00013164 at META3047MDL-136-00013213.


“relationship impacts,” “parents neglecting their kids,” “safety risks,” and “regretful purchases.”¹⁵⁶ See image below.¹⁵⁷



Current PU Experience


All problematic users were experiencing multiple life impacts.

- **Loss of productivity** - (1) Giving up. The person won't do the task/ activity outside FB. (2) Postponing the beginning. The person will take more time to start the task/ activity off FB. (3) Extending the duration. The person will take more time to complete the task because will stop to check FB.
- **Sleep disruption** - (1) Delaying/reducing sleep hours due to loss of time control; (2) Waking up and checking FB prolonging a return to sleep; and (3) Sleep loss due to disturbing content, like politics or violence.
- **Relationship impacts** - People together but separately on their phones. And a false sense of closeness created by seeing updates on FB, but fewer offline visits.
- **Parents neglecting their kids** - Parents focused more on FB than caring for or bonding with their children. Or refrained from reprimanding kids for risk of later “retaliation” on their own use.
- **Safety risks** - Loss of situational awareness around environmental dangers (moving vehicles, pickpockets).
- **Regretful purchases** - Spending money on things they didn't need.




I was late to my cousin's wedding because I was watching a video. He's my godfather so it was a shame. Why were you late? I was on Facebook; I forgot the time.

P3, 22 (f) Brazil




Sometimes I don't pay the attention I should to my son. I love to play with him, and the phone sometimes distracts me”.

P7, 32 (m) Brazil




One day I was stepping out of the train. I should've been in the middle, but I was on the edge only. I was on my phone. A person kind of pushed me inside. I got saved! After that, I just sit and do it.

P4, 30 (m) India



Sometimes I lose sleep. If I have to wake up at 6am and I'm on FB at night, I look at the phone and it's 2am. Sometimes I'm so involved that I go on and it's hard to wake up the next morning.

P5, 20 (f) Brazil



- B. The Facebook Qualitative Study notes how difficult it is to perceive addictive behaviors in ourselves, even when others can see there is a problem. “Many mentioned parents, partners and friends complaining about their use, but it didn’t always sink in. Feelings of guilt were an indicator of higher awareness.”¹⁵⁸
- C. Facebook researchers also found significant *opportunity costs* with Facebook use,¹⁵⁹ quoting one participant as saying, “I spend too much time on social networks and Facebook. I could study more, I could read a book, I could exercise. Because I spend too much time on Facebook, I waste my time and I don’t do useful things...;”¹⁶⁰

¹⁵⁶ META3047MDL-087-00030017 at META3047MDL-087-00030044.

¹⁵⁷ META3047MDL-087-00030017 at META3047MDL-087-00030044.

¹⁵⁸ META3047MDL-087-00030017 at META3047MDL-087-00030042.

¹⁵⁹ META3047MDL-087-00030017 at META3047MDL-087-00030036.

¹⁶⁰ META3047MDL-087-00030017 at META3047MDL-087-00030036.

- D. Another participant said, “The time I spend is not healthy, it’s like an addiction. Opening the app every half hour, it’s not healthy.”¹⁶¹
- E. To be sure, some participants in the Facebook Qualitative Study acknowledged the good and the bad of social media: As one respondent says, “I’ve got some good things on FB so that’s the reason why I’ve devoted so much time on it... This is something that I’m confessing to myself I want to devote time to my loved ones; FB is helping me to take care of my social obligations.”¹⁶² Another says about Facebook, “60% useful and 40% useless because you can’t control what is there and so you see everything.”¹⁶³ These positive uses notwithstanding, the beneficial effects of social media use do not negate the harms caused to those who are addicted, especially where addictiveness is a feature of the product.
- F. Meta internal documents describe “Perceived life interference from app use is highest for younger users,” relating to a graph showing that teens (13-17) are most adversely affected by problematic/addictive use.¹⁶⁴
- G. See figure below:¹⁶⁵

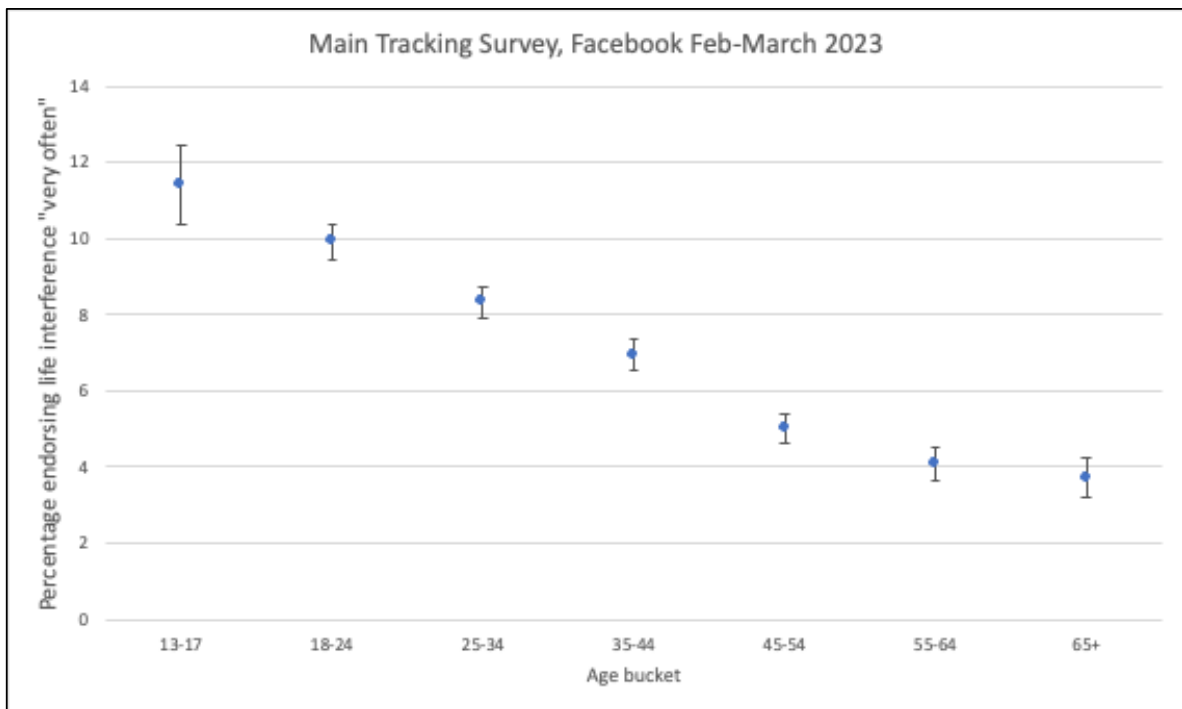
¹⁶¹ META3047MDL-087-00030017 at META3047MDL-087-00030036.

¹⁶² META3047MDL-087-00030017 at META3047MDL-087-00030038.

¹⁶³ META3047MDL-087-00030017 at META3047MDL-087-00030038.

¹⁶⁴ META3047MDL-050-00215087 at *18 (produced natively).

¹⁶⁵ META3047MDL-050-00215087 at *18 (produced natively).



H. In the same global survey presented by Davis and Latshaw referenced above, Instagram users reported that Instagram interfered with their lives, in particular fulfilling other responsibilities, a consequence of addiction referred to as opportunity costs. “Users reporting low control also report higher ‘life interference’ from their app use (i.e., perceiving that use of Instagram prevents the fulfillment of other responsibilities). Low attentiveness: 20-25% higher life interference; low capability 17-23% higher life interference.”¹⁶⁶

v. Tolerance/Withdrawal:

A. As discussed previously in this Report, continued engagement with an addictive medium is driven in part by neuroadaptation to the stimulus which contributes to tolerance and withdrawal, also known as ‘wanting but not liking.’

¹⁶⁶ META3047MDL-074-00027496 at *10 (produced natively).

- B. Meta’s own Shayli Jimenez said, “IG [Instagram] is a drug,”¹⁶⁷ and her colleague Ebo responded, “LOL, I mean, all social media. We’re basically pushers,” to which Jimenez responded, “Seriously it is! We are causing reward deficit disorder because people are bingeing on IG so much they can’t feel reward anymore, like their reward tolerance is so high.”¹⁶⁸ Jimenez later claimed that this was said “sarcastically in a Chat.”¹⁶⁹ In the same chat, Jimenez also shared images of the addiction cycle and Nayir Eyal’s “The Hook Model.”¹⁷⁰
- C. Fear of missing out (FOMO) is common sign of withdrawal from social media and a dysphoric feeling that drives re-use contrary to intention or desire. Instagram internal data show that “42% of US teen WAU with self-reported low control over their IG usage experience FOMO if they don’t check IG often (Hanko 2022, report forthcoming),” and “42% are concerned about offending friends if they don’t immediately respond to messages.”¹⁷¹
- D. A recent study led by the University of Chicago economist Leonardo Bursztyn surveyed 1,000 college students and asked them how much they would need to be paid to deactivate their accounts on either Instagram or TikTok for four weeks.¹⁷² On average, students said they’d need to be paid roughly \$59 to deactivate TikTok and \$47 to deactivate Instagram.¹⁷³ But when asked how much to deactivate if most others do too, most students were willing to deactivate for no money and pay others to do the same.¹⁷⁴

¹⁶⁷ Deposition of Shayli Jimenez, Volume I, February 11, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), Exhibit 17,

¹⁶⁸ Deposition of Shayli Jimenez, Volume I, February 11, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), Exhibit 17,

¹⁶⁹ Deposition of Shayli Jimenez, Volume I, February 11, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 263:25-264:10.

¹⁷⁰ Deposition of Shayli Jimenez, Volume I, February 11, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), Exhibit 17; See SNAP5486213 at SNAP5486214.

¹⁷¹ META3047MDL-136-00013164 at META3047MDL-136-00013190

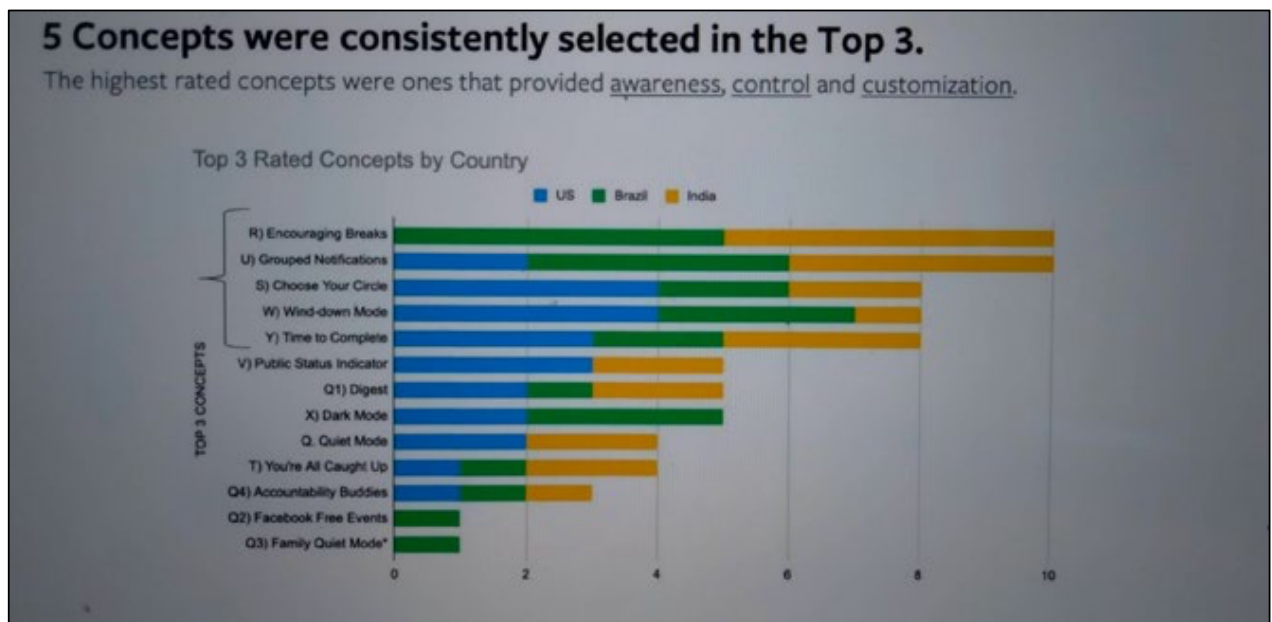
¹⁷² Bursztyn, L., Handel, B., Jimenez, R., & Roth, C. (2023). When product markets become collective traps: the case of social media. <https://doi.org/10.3386/w31771>

¹⁷³ Bursztyn, L., Handel, B., Jimenez, R., & Roth, C. (2023). When product markets become collective traps: the case of social media. <https://doi.org/10.3386/w31771>

¹⁷⁴ Bursztyn, L., Handel, B., Jimenez, R., & Roth, C. (2023). When product markets become collective traps: the case of social media. <https://doi.org/10.3386/w31771>

vi. Wellbeing:

- A. Facebook’s own researchers identify ways to intervene or reduce “problematic use (PU)” and “loss of control over time spent (LCOTS),” namely by increasing “situational awareness, sense of control, customization, transparency and a sense of completion” and “removing time sensitivity.” This suggests that reducing the impact of the addictive design elements, like hidden algorithms driving engagement, tracking user data covertly to drive the algorithms, and features like autoplay, endless scroll, and notifications, detract from a sense of completion and create time urgency.¹⁷⁵ The researchers ask Facebook users to rate suggested design features that might help.¹⁷⁶ See image below for full list.¹⁷⁷



- B. Facebook Wellbeing researchers note that participants in the study tried to reduce their own addictive use and failed: “I turn off notifications. I don’t want them to be poppin’ up on me. If I commented on your picture, then I get a notification from people commenting who aren’t even my friends;”

¹⁷⁵ META3047MDL-087-00030017 at META3047MDL-087-00030018, META3047MDL-087-00030105

¹⁷⁶ META3047MDL-087-00030017 at META3047MDL-087-00030057.

¹⁷⁷ Haugen_00016373 at Haugen_0001431. See also META3047MDL-087-00030017 at META3047MDL-087-00030057.

“Apple tells you how much time you’re on so I’m trying to track that to minimize it;” “I tried to set up a certain time to spend on FB, but it was impossible.”¹⁷⁸

- C. Facebook researchers concluded, “Only a few had attempted remediation tactics, and none had found a full solution. Most flailed with fruitless tactics or resorted to extreme measures.”¹⁷⁹
- D. As per Instagram’s own internal documents, “IG has a comprehensive list of well-being features but they hard [sic] to find and use cases are not explicitly clear.”¹⁸⁰
- E. Even after Instagram introduced its Well-being features, whether daily usage limits, Take a Break, or Quiet Mode, they were are all opt-in features, and any default mode could be opted-out, including for teens.¹⁸¹
- F. Per internal documents, “Overall awareness of some mental well-being products is low, demonstrating there is an opportunity to reach teens more consistently.”¹⁸² Less than 3% of Weekly Active Users of Instagram have enabled Take a Break and 0.2% honor it. Less that 1% of WAU have enabled a daily limit of Instagram, and 0.08% honor it.¹⁸³
- G. Instagram advises using ‘Creators’ to ‘upsell’ measures to limit Instagram use, like “Selena Gomez x Take a Break upsell, Megan thee Stallion x Quiet mode.”¹⁸⁴ This is an example of the fox guarding the hen house. Creators rely on large audiences and number of views to promote their brand. They are not well-positioned to encourage young people to get off of Instagram. Instagram’s own documents attest that “Creators say they feel constant pressure to create to sustain engagement and growth and believe that they will be ‘punished’ by low distribution if they take a break from creating (Data suggests [sic] that at least a portion of this is perception vs. reality).”¹⁸⁵

¹⁷⁸ META3047MDL-087-00030017 at META3047MDL-087-00030045.

¹⁷⁹ META3047MDL-087-00030017 at META3047MDL-087-00030045. (emphasis in original)

¹⁸⁰ META3047MDL-136-00013164 at META3047MDL-136-00013174.

¹⁸¹ META3047MDL-148-00012112 at META3047MDL-148-00012119.

¹⁸² META3047MDL-136-00013164 at META3047MDL-136-00013175.

¹⁸³ META3047MDL-136-00013164 at META3047MDL-136-00013210.

¹⁸⁴ META3047MDL-136-00013164 at META3047MDL-136-00013198.

¹⁸⁵ META3047MDL-136-00013164 at META3047MDL-136-00013200.

- H. In response to the suggestion to “Expand Take a Break to support app-opens,” the decision was to “not recommend Especially since direct messaging is a major reason for app opens.”¹⁸⁶ This document shows Instagram prioritizing opening their app over user wellness.
 - I. In response to the question, “How will we know if we’ve solved this problem [problematic use] for people,” an internal Meta document states, “Success metric: increase in the average amount of time users spend with others in a world.”¹⁸⁷
 - J. The “Alternate Topic Nudge” is described as “We’re interrupting people from dwelling on a topic and empowering them to make informed choices so they feel their time on Instagram is intentional.”¹⁸⁸ The measure of its effectiveness is described as follows: “12% of teens who see a topic nudge, tap in [sic] on one or more new topics. This leads to less time spent scrolling endlessly on one type of content that may have been making them feel worse.”¹⁸⁹ But importantly, Instagram is not calling for measuring whether they’re spending less time scrolling overall.
- vii. As summarized by Meta’s own internal documents, Meta’s awareness of “Problematic Use” (aka social media addiction) is “High,” while their “Product investment” is “Mid-Low.”¹⁹⁰ Or, again in Meta’s own words, “The stance we have historically taken is to give people control, but not in a way that hurts metrics.”¹⁹¹
- viii. Meta’s own Empathy Team, charged with safeguarding the well-being of its users, concluded that “Product features that are designed to exploit insecurity, or provide a dopamine rush (likes, notifications, the pull-down-to-see, the infinite scroll, etc), to increase time spent, are inherently at odds with well-being and take away from people’s ability to consciously focusing on activities that add value to their lives.”¹⁹² I agree.

¹⁸⁶ META3047MDL-136-00013164 at META3047MDL-136-00013214.

¹⁸⁷ META3047MDL-047-01167629 at META3047MDL-047-01167633.

¹⁸⁸ META3047MDL-148-00012112 at META3047MDL-148-00012124.

¹⁸⁹ META3047MDL-148-00012112 at META3047MDL-148-00012124.

¹⁹⁰ META3047MDL-050-00215087 at *13 (produced natively).

¹⁹¹ META3047MDL-047-01167629 at META3047MDL-047-01167644.

¹⁹² META3047MDL-050-00184006 at META3047MDL-050-00184015.

- c. **Snapchat** exploits behavioral reward mechanisms with its addictive and unsafe social media products targeted at kids.
 - i. Access (How Easy):
 - A. Snapchat has made it easy for young users to access its platform. There is no age verification process, so anyone at any age, including children under the age of 13, can access Snapchat and create an account.¹⁹³
 - B. Snapchat reaches 90% of youth between the ages of 13 and 24 in the US.¹⁹⁴ Snapchat has promoted its use in spaces where kids gather, including in schools.¹⁹⁵ By increasing access, Snapchat has increased the likelihood that kids and teens will get addicted to Snapchat.
 - C. The Bitmojis, cartoon avatars to identify users, contribute to the youth branding.¹⁹⁶
 - D. Snapchat's own documents admit to targeting young users: "Snapcodes are in magazines targeted at younger audiences (e.g. Seventeen)."¹⁹⁷
 - ii. Quantity (How Much):
 - A. Snapchat's Discover page includes *endless scroll* by default.¹⁹⁸ Snapchat's Nona Farahnik Yadegar, Head of Product and Content Policy, wrote to Snapchat's REDACTED Policy Manager, on October 13, 2020, "Not sure what to say about addictive endless scrolling. We already have an endless scroll design in Discover and I think we wish it was more addictive compelling."¹⁹⁹ In 2024, Snapchat launched "Simple Snapchat" which "combines the app's Stories and Spotlight into one bottomless feed."²⁰⁰

¹⁹³ Deposition of Claudia Y. Chan, February 7, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 107:3-19, 118:1-14.

¹⁹⁴ SNAP2109600 at SNAP2109601.

¹⁹⁵ SNAP2076002; SNAP3744792; SNAP4354972 at SNAP4354975; SNAP5182516; SNAP4620287

¹⁹⁶ SNAP6403466 at SNAP6403469.

¹⁹⁷ SNAP5486213 at SNAP5486214.

¹⁹⁸ SNAP0064557 at SNAP0064558.

¹⁹⁹ SNAP1393050-SNAP1393051. (strikethrough in original).

²⁰⁰ Chandonnet, H. (2024, September 20). Why social media companies keep copying each other. Fast Company. <https://www.fastcompany.com/91194667/why-social-media-companies-keep-copying-each-other>.

- B. *Autoplay*, one video rolling directly into the next, occurs on Snapchat *Stories*. When there are no more *Stories by friends*, Snapchat defaults to *Discover*, videos created by Snapchat creators who are not friends, which is also an endless scroll that defaults to autoplay.²⁰¹
- C. *Spotlight* is another feature that provides a tailored *endless scroll*.²⁰² In response to forced content, one Snapchat user wrote to Snapchat corporate to say, “I dont [sic] like being forced to see spotlights, all I’m seeing is half dressed females twerking and dancing it’s not relevant for me. I rather choose what I want to see!!”²⁰³ And another wrote, “Please tell me how to turn off spotlight I hate it and I dont [sic] want to see it. Theres a reason I dont [sic] have tiktok installed it’s because I dont [sic] want to see this type of content it was much better when I could see helpful things like news articles. Where are they? And how do I access that again?”²⁰⁴

iii. Potency (How Strong):

- A. Snapchat is a highly potent social media product based on the many interactive features which are designed to promote social validation, enhance social reputation, and create in-group/out-group comparisons.
- B. The *algorithmic feed* targets the individual user setting up the cycle of intermittent positive reinforcement that drives continued engagement, and continued engagement is Snapchat’s stated goal.
- C. On Tuesday, Mar 28, 2017 at 2:26 PM, [REDACTED] of Snapchat sent an email to [REDACTED] of Snapchat exploring how to meet Snapchat’s CEO Evan Spiegel’s corporate goal to increase time spent on Snapchat for the purposes of making a profit,²⁰⁵ displaying therein their willingness to exploit the science of habit formation and modify their platform to do that.

²⁰¹ Deposition of Michael E. Weissinger, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), December 18, 2024, at 112:6-113:13, 115:5-116:3, Exhibit 6 (SNAP0307144 at SNAP0307147)

²⁰² SNAP1393050; Kraus, R. (2020, November 23). Snap launches TikTok competitor Spotlight with payouts for viral posts. Mashable. <https://mashable.com/article/snapchat-introduces-spotlight>

²⁰³ SNAP0188592 at SNAP0188595.

²⁰⁴ SNAP0188592 at SNAP0188606.

²⁰⁵ SNAP3760712 at SNAP3760713.

- D. “Evan proclaimed our mission is to increase engagement (time spent) in the app. 2. If we want to create enough inventory in Discover to kill Snap Ads in User Stories, and if we want to increase time spent in our app, Discover is the silver bullet. We could surface the best Snaps and Stories from Popular Accounts, and even from any Public or Live Submitted Snap - inside Discover. This isn't about copying Instagram's Explore page - it's about telling stories on Snap in all the ways stories can be told. Our definition of a 'Live Story' right now is great, but limited. Memes are stories - and stories can be told in a single snap. Let's surface this content and allow people to browse through the best stories from around the world every day. 3. Why will this increase time spent? Habits are built in times of boredom. Instagram LIVES in this domain. People spend hours a week watching video and meme after video and meme. We have as much good content on our platform - why not offer that to our users? What if we set out a goal to double our daily time spent by end of year? 4. Why will this increase monetization? More time spent -> more dollars...Desired Result: 1. Now: Build a roadmap to surface more and more relevant content via Discover[.] 2. Q2: Start with surfacing recommended popular accounts[.] 3. Q3: Start surfacing popular memes and snaps[.] 4. Step 4: ???? 5. Step 5: Profit.”²⁰⁶
- E. The *posts*, *favorites*, *shares*, and *comments* enumerated at scale promote social comparisons at scale and create the reward expectancy that motivates continued engagement. Snapchat's own documents describe how internal triggers (internal emotions) related to reward expectancy and fear of missing out; and external triggers (the design features themselves) related to social rewards are exploited to get users hooked: “Internal Trigger: users need a reason to come back to Snapchat (vs going to another social app). If we can get things like the actions/UI and rewards right, the internal triggers become things like FOMO, wanting to get the news, and staying in touch with all friends. Additionally, internal triggers should play on what users are already doing - things like community meetups (e.g. school network), affinity groups (e.g. run club), and family engagement (e.g. sharing photo albums).”²⁰⁷

²⁰⁶ SNAP3760712 at SNAP3760713.

²⁰⁷ SNAP5486213 at SNAP5486214.

- F. An internal Snapchat qualitative study captures the reinforcing nature of Snapchat's interactive platform: "The freedom to post anything and tendency for more 1-1 chats/Snaps means users engage with the app more frequently and regularly than others. For many, it becomes part of their daily routines and habitual actions (first thing in the morning, during breaks, when winding down or alone at night and anytime new notifications arrive). Since interactions are often humorous or light-hearted, users feel excited, positive, happy, creative and anticipatory while using."²⁰⁸ It is no surprise that Snapchat users feel 'excited, positive, happy, etc' when using Snapchat. They are experiencing the rewarding properties (the 'high') of the medium, which creates the conditions for the come-down or withdrawal, i.e. feeling depressed, irritable, and anxious, when they're not using. The development of 'anticipatory' use hints at addiction and craving to follow.
- G. *Friend Emojis* such as *BFF*, reward the user for the number of messages sent or for maintaining lengthy Snap Streaks.²⁰⁹
- H. *Maps* allows teens to 'flex' social status through location sharing. Maps allows users to know where their friends are on a map in relation to themselves.²¹⁰ They can choose to reveal their location, or not (ghost mode).²¹¹ Teens will often use this feature to 'flex' their location in relation to others. These comparisons increase the potency of the medium through social validation and reputation enhancement. Per Snapchat's own user research, "Eleanor, F15: #1 power user of Maps, opens it 5x/day, her intent hit every major use cases, constantly toggling ghost mode on and off, she would love to be able to actively share her location as an update to 'flex' to her friends, turned her location on for the first time this summer only because she loves how cute her bitmoji looks, never looks at Explore."²¹²
- I. *Streaks* on Snapchat track and quantify continuous daily messaging which encourages daily engagement for fear of losing a streak. Snapchat's own corporate documents confirm

²⁰⁸ SNAP2462286 at SNAP2462289.

²⁰⁹ SNAP4951751; SNAP2183204 at SNAP2183214; Snapchat Support (n.d.) What do my Friend Emojis mean on Snapchat? <https://help.snapchat.com/hc/en-us/articles/7012335460372-What-do-my-Friend-Emojis-mean-on-Snapchat>

²¹⁰ SNAP5274657

²¹¹ SNAP5274657 at SNAP5274659.

²¹² SNAP4836937 at SNAP4836938.

that, “Streaks makes it impossible to unplug for even a day.”²¹³

- J. Snapchat’s Greenberg qualitative study specifically calls out streaks as “addictive”: “Maintaining streaks (called ‘flames’ in Germany, ‘little fires’ in Brazil) is also a strong motivator (mostly for teens) to engage regularly. In Germany, streaks are a social status symbol, representing one’s popularity. In India and Brazil, they’re more about the time invested, and users wanted to maintain them from a sense of accomplishment. On the flipside, streaks are negatively perceived as ‘addictive’ and when they’re broken, users either recognize their insignificance or feel disappointed/frustrated by the loss, both of which demotivate continued engagement.”²¹⁴ The ‘disappointment’ and ‘frustration’ users feel at the loss of Snap streaks is also akin to craving and withdrawal, and far from demotivating them, can also incentivize them to spend more time on the platform to get their streaks back. The fact that some users may recognize the insignificance of Snap streaks does not negate the fact that a substantial population of users perceives them as a powerful incentive to continued engagement—the very goal described in Snapchat internal documents, cited above.
- K. Snapchat users summarize the problems caused by streaks as follows: “It’s stressful to have to send a Snap to my friend every day when a Streak gets big,” “I feel obligated to maintain my Streak because I’m afraid of my friend’s reaction if I don’t,” “The Snaps I send to maintain my Streaks may be low quality because I just want to get the task out of the way,” and “With my Streaks-only friends, I miss good content because I just assume all the content is Streaks.”²¹⁵ Fifty-five percent of users who Streak on Snap report doing it “to see how high we can get the number.”²¹⁶ Only 13% Streak “to gauge how strong my relationships are with people.”²¹⁷

²¹³ SNAP2183204

²¹⁴ SNAP2462286 at SNAP2462289.

²¹⁵ SNAP2183204 at SNAP2183244.

²¹⁶ SNAP2183204 at SNAP2183274.

²¹⁷ SNAP2183204 at SNAP2183274; *see also* SNAP3151495 (“Streaks are taken extremely seriously due to social pressure...”).

iv. Novelty (How New):

- A. Snapchat uses notifications to alert consumers of new incoming *posts, favorites, comments, shares*, which primes users to feel a compulsion to check Snapchat, even when their attention is directed elsewhere.
- B. In 2019, Snapchat added the *Always on* feature, a visual cue on top of the icon for *Spotlight*, alerting users of new content, set to go off every half hour by default.²¹⁸ Their own data show that the *Always On* feature markedly increased traffic on their platform.²¹⁹

v. Uncertainty (How Likely):

- A. Snapchat has many design features that increase uncertainty through intermittent positive rewards, thereby enhancing its addictive potential.
- B. The algorithm produces optimal uncertainty,²²⁰ like a slot machine to promote further engagement.
- C. Disappearing messages and Stories on Snapchat are a core feature of its product,²²¹ enhancing the need to constantly be on the platform so as not to miss out content or messages.
- D. *Snapchat* randomly assigned *Trophies*, which were discontinued in 2020, to users.²²² Snapchat's own documents describe the "habit forming flywheel" (see below) and how trophies function as variable rewards to hook the Snapchat user: "Giving customers a variable reward such as the existing unlockable 'trophies', getting help, and showing off in a social world. Allowing customers to invest with the experience by doing things like build a friend set, building a profile to get better recommended friends/filters/IRL (in real life) engagements. Finally, yielding internal triggers such as a customer coming back to the app out of boredom or FOMO (fear of missing out)."²²³ Discontinuation of the *Trophies* function did not lessen the addictive power of the other

²¹⁸ SNAP4227244

²¹⁹ SNAP4227244

²²⁰ SNAP6116693 at SNAP6116696; SNAP0464752; SNAP3666384 at SNAP3666389; SNAP3074582

²²¹ SNAP2097141 at SNAP2097143; SNAP0886473 at SNAP0886474; SNAP0020087.

²²² SNAP4954018.

²²³ SNAP5486213 at SNAP5486214.

Snapchat features described in the internal documents and in this Report.

The Hook



- E. Elaborating on the importance of variable rewards, “Variable Rewards: Snapchat already gives unlockable ‘Trophies’ but it isn’t until one is unlocked that a user knows what it is or why they got it. Also, the user doesn’t see the Trophies unless they go to the profile page and look at the Trophy icon. The Trophies are also very generic to the app functionality and not the user psychology. Rewards are awesome when they scratch a psychological itch like commending a hard workout

schedule, or celebrating a mom who is working and raising great kids.”²²⁴

- F. *Snapchat* discussed how to make trophies even more potent: “Rewards: celebrate Trophies as they’re granted. Test having confetti fall on the screen with the Trophy and what the user did to unlock it. Have achievement Trophies for life wins, too - like ‘went to gym 5 times,’ ‘showcased cool homework project,’ etc.”²²⁵
 - G. *Spotlight* randomly highlights certain stories as a form of special recognition for those who post. It also features cash incentives, thereby providing additional rewards to drive engagement.²²⁶ As one Snapchat user wrote, “...Snapchat just introduced ‘spotlight’ which is basically like Tiktok with a bribe of money involved.”²²⁷ In other internal documents, “Users are excited that Snap introduced this feature [Spotlight], some saying that the content is very addicting. Most users are calling out that all social media platforms are copying each other.”²²⁸ Said one user of Snapchat Spotlight, “Been using it the past few days and it’s pretty addictive.”²²⁹
 - H. Filters, also known as lenses, are another way Snapchat promotes uncertainty. As per Snapchat’s own documents, “Filters (lenses) are short-lived and Snapchat seen as slow and heavy for non-Apple phones[.] The excitement of new filters quickly fades, and favorite filters may disappear, creating frustration for some users.”²³⁰
- d. **Snapchat**’s own documents provide evidence that its social media products lead to out-of-control use, continued use despite consequences, and withdrawal.

²²⁴ SNAP5486213 at SNAP5486214.

²²⁵ SNAP5486213 at SNAP5486215.

²²⁶ SNAP0188592-SNAP0188614. *See also* Deposition of Peter J. Sellis, February 6, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 297:5-22 (“Spotlight would qualify as [a] variable reward [system].”).

²²⁷ SNAP0188592 at SNAP0188608

²²⁸ SNAP0188592 at SNAP0188605.

²²⁹ SNAP0188592 at SNAP0188609.

²³⁰ SNAP2462286 at SNAP2462289.

- i. Out of Control use:
 - A. In an email dated Friday, October 13, 2023, Rachel Racusen of Snapchat wrote to Snapchat colleague Jennifer Stout, in reference to focus groups with parents of teens using Snapchat, “Parents often mention their teens' seemingly uncontrollable need to ‘keep their streaks alive’ associating the practice with ceaseless online communication and screen addiction.”²³¹
 - B. On the same email chain Racusen included another parent’s comment, “‘I don't like the fact that they have this Streaks thing and then they also rank...my daughter will say ‘she's my number one’ which means you can see someone's ranking on how much they're snapping someone. That automatically leaves people out and it's just odd.’ -- Parent of 15 year old and 17 year old Snapchatter.”²³²
- ii. Consequential use:
 - A. According to Snapchat’s own data, 6% of Snapchat users find Snapchat *Streaks* “very stressful,”²³³ with users reporting, “You wake up and see those timers and you're like I need to reply back to all of them. That can be stressful.”²³⁴ And “If you get to at least 20 you’re like, Okay, I got this!’ ... If I get higher than 20-30 I’m like, ‘I have to keep this!’”²³⁵ The same research showed that 48% of users reported that Streaks caused “Little (33%) + Moderate (15%)” stress.²³⁶ In another survey of 240 Snapchat users aged 13-20, 53% of those surveyed agreed that “streaks are stressful.”²³⁷
 - B. On January 7, 2020, Snapchat’s Lauryl Schraedly wrote to Stephanie Brooks, “Should talk about the downside of streaks somewhere too. Definitely a source of frustration when streaks are lost and not a positive experience to send photos of nothing back and forth each day.”²³⁸ Stephanie Brooks responded, “add sentence around: frustration of loss

²³¹ SNAP1251784

²³² SNAP1251784

²³³ SNAP2183204 at SNAP2183234.

²³⁴ SNAP2183204 at SNAP2183245.

²³⁵ SNAP2183204 at SNAP2183245.

²³⁶ SNAP3800391.

²³⁷ SNAP7307710.

²³⁸ SNAP5553072

(resentment), positive benefit is transitory/not meaningful, addictive nature.”²³⁹ Snap’s internal research found that one of the “Downsides of Streaks” was that users “send low-quality Snaps to maintain my Streak just to get the task out of the way.”²⁴⁰ Snap’s CEO, Evan Spiegel, acknowledged in a chat message that maintaining Streaks in this way is “a toxic behavior.”²⁴¹

- C. A Snapchat user threatened to hurt themselves if their account was not restored, “Situation: User threatens to kill or harm themselves if they don’t get their memories and account back.”²⁴² Another user wrote to Snapchat corporate and expressed desperation to get her account back: “Hello Even [sic], I am writing to you because I have a permanently locked snapchat account. I have no idea why it has been locked. The support team and the emails are repetitive and unhelpful. I hope you can help me. I have lost all my sincere memories with my friends and a 700+ day streak. I probably seem like a teen girl that is addicted to snapchat but I just want my account back. I was locked out 12/27/21 for unknown reasons.... Please I’m begging you [to] help me.”²⁴³

iii. Tolerance/Withdrawal:

- A. As discussed previously in this Report, continued engagement with an addictive medium is driven in part by neuroadaptation to the stimulus which contributes to tolerance and withdrawal, also known as ‘wanting but not liking.’
- B. Snapchat’s own documents demonstrate that some users become panicked and ‘desperate’ by the loss of streaks, a reaction akin to withdrawal, and are willing to put in time, energy, and money to try to get them back.²⁴⁴

²³⁹ SNAP5553072

²⁴⁰ SNAP2425354 at 2425357.

²⁴¹ SNAP6110229 at SNAP6110232; SNAP6110234.

²⁴² SNAP1601242

²⁴³ SNAP1117208

²⁴⁴ SNAP1117208

- C. The fact that Snapchat implemented a fee for getting streaks back²⁴⁵ demonstrates that some users are motivated enough to pay money to restore streaks.
- e. **YouTube** exploits behavioral reward mechanisms with its addictive and unsafe social media products targeted at kids.
 - i. Access (How Easy):
 - A. YouTube’s explicit market includes both children and teens, and specifically kids under age 13. YouTube internal documents reveal, “YTK Growth Strategy: Become a Daily Tool for All U13 Kids Globally.”²⁴⁶
 - B. In 2019, Google estimated that there were “~700MM 28DA [day average] Age Unknown accounts...across Google,” of which YouTube is “the most commonly used product by these accounts.”²⁴⁷ Google noted that “approximately 50MM” Google accounts correspond to underage users based on inferred age via age demographics.²⁴⁸
 - C. In addition, YouTube users, including children and teens, can access YouTube in a “signed-out” or “logged out” state, without the need to create an account or provide a birthdate.²⁴⁹ In 2018, over a third of users accessed YouTube in a signed-out state.²⁵⁰ YouTube recognizes that underage users take advantage of the ability to access YouTube in a signed-out state, concluding in 2022 that “the vast majority of u13 usage is not happening in our current user-based solutions – it’s happening anonymously on YT.”²⁵¹
 - D. YouTube assumes that “age unknown” users (i.e. users as to whom the age inference model can’t compute an age) are adults even though many are likely minors. YouTube discusses the financial implications of treating age-unknown users as minors. “Not being able to treat age unknown users as adults may have drastic effects on YouTube creators, both

²⁴⁵ Snapchat Support (n.d.) How Much does it restore to a Snapstreak?. Snap Inc. <https://help.snapchat.com/hc/en-us/articles/13086861638676-How-much-does-it-cost-to-restore-a-Snapstreak>; SNAP0396889; SNAP4235763-65

²⁴⁶ GOOG-3047MDL-01608261 at *3 (produced natively).

²⁴⁷ GOOG-3047MDL-01653710-GOOG-3047MDL-01653711.

²⁴⁸ GOOG-3047MDL-01653710.

²⁴⁹ GOOG-3047MDL-04269559 at GOOG-3047MDL-04269615-GOOG-3047MDL-04269616

²⁵⁰ GOOG-3047MDL-04269559 at GOOG-3047MDL-04269615.

²⁵¹ GOOG-3047MDL-01735688

from a monetization and community engagement perspective.”²⁵²

- E. In a YouTube presentation, “Literature Review: Effects of Watching Digital Videos on Viewer Well-Being,” the author first acknowledges that “Gaming Content on YouTube is sought out by inappropriately-aged children,” namely “underage” viewers, and further that “Watching this gaming content [on YouTube] can become addictive,” and “If DSM criteria were applied to watching gaming videos, 1 in 5 teens would be diagnosed addiction.”²⁵³ If we were to apply YouTube’s own “1 in 5 teens” estimate, to its own estimated “458 [million] Broad GenZ Gaming Viewers” that would mean millions of teen users are addicted to YouTube.²⁵⁴

ii. Quantity (How Much):

- A. YouTube’s default approach to launching content streams (e.g. endless scroll and autoplay) is to have these features be “on” by default across the platform, including *Home*, *Search*, *Watch Next*.
- B. In a slide show created by YouTube’s [REDACTED] dated April 2018, entitled “Literature Review: Effects of Watching Digital Videos on Viewer Well-Being,” a slide labeled “Excessive video watching is related to addiction,” goes on to describe how “Researchers feel that YT is built with the intention of being addictive. Designed with tricks to encourage binge-watching (i.e. autoplay, recommendations, etc). These ‘tricks’ have become routine.”²⁵⁵
- C. A YouTube engineer describes in an email exchange how he uses the behavioral science of how to get users ‘hooked’ to increase YouTube watch time, in particular among new users: “...I began by asking who our very low activity users were, and wanted to see if I could identify a cohort of those users who are showing a signal that they are [sic] may be interested in consuming more YouTube content. Once identified using a novel User State Transition model I developed, I applied patterns learned in Nir Eyal’s ‘Hooked’ model to re-enforce a

²⁵² GOOG-3047MDL-01653710-GOOG-3047MDL-01653711.

²⁵³ GOOG-3047MDL-00874191 at *26 (produced natively).

²⁵⁴ GOOG-3047MDL-00284728

²⁵⁵ GOOG-3047MDL-00874191 at *12 (produced natively).

user's desired behavior until they begin to form organic habits for that behavior. In the case of this notification am attempting to get users to form a YouTube viewing habit where there previously was none. This work is still ongoing, but looks promising.”²⁵⁶

iii. Potency (How Strong):

- A. YouTube’s documents show how its interactive design features promote social rewards. Indeed, YouTube lists its interactive design features under “Social rewards.”²⁵⁷
- B. “Social rewards[:] Receiving a reply to your comment[:] A friend hearting your video[:] Getting lots of videos/comments/subs[.] Recognition reward[:] Recognize live stream donors with a shout-out and a noticeable green bar[:] Analytics (# views, likes, etc)[.] Monetary reward: Ad revenue[:] Donations from viewers.”²⁵⁸
- C. YouTube’s reward potency is attributable to its *Likes, Shares, View Counts, Comments, Livestream Donations*, and quick turnaround time for feedback at scale, which YouTube calls “stickiness.”²⁵⁹ In an internal YouTube slideshow presentation dated April 2018 entitled “Literature Review: Effects of Watching Digital Videos on Viewer Well-Being,” the authors write, “YouTube ‘stickiness’ is caused by the interactive nature of our platform,”²⁶⁰ and “YouTube allows for users to watch videos, but also to interact with creators and other viewers. Users receive notifications when someone makes a post or comment on a video. Interactive behavior gratifies user needs[.] Causes users to feel that they must be aware of what is happening on the platform[.] Keeps users on the platform longer[.]”²⁶¹ These findings were based on a survey of 265 YouTube users.²⁶²
- D. In 2012, YouTube changed its algorithm to optimize for “watch time.”²⁶³ YouTube describes in an internal document on youth

²⁵⁶ GOOG-3047MDL-02009802

²⁵⁷ GOOG-3047MDL-01268284 at *16 (produced natively).

²⁵⁸ GOOG-3047MDL-01268284 at *16 (produced natively).

²⁵⁹ GOOG-3047MDL-00874191 at *9 (produced natively).

²⁶⁰ GOOG-3047MDL-00874191 at *9 (produced natively).

²⁶¹ GOOG-3047MDL-00874191 at *9 (produced natively).

²⁶² GOOG-3047MDL-00874191 at *9, see speaker notes (produced natively).

²⁶³ GOOG-3047MDL-00000064 at GOOG-3047MDL-00000065.

consumers how personalized searches increase time spent on the platform: “Personalized Rec’s are the killer app (70% of watch time, higher for loyal users).”²⁶⁴

- E. YouTube Shorts are a short-form video format that YouTube launched to compete with Instagram Reels and Snap Spotlight. YouTube describes the potency of the short video format—its impact on dopamine—as follows: “Watching short videos results in a ‘quick fix’ of dopamine[.] Dopamine is related to feelings of reward[.] Similar to feelings of reward when using drugs or other addictive substances[.]”²⁶⁵

iv. Novelty (How New):

- A. YouTube sends 2.3 billion notifications per day, both “contractual notifications” to subscribers and “affinity notifications” to non-subscribers.²⁶⁶ *Notifications* alert the user to incoming messages and other posts by default, creating the urge to “watch” even while attention is directed elsewhere, and exploiting dopamine’s sensitivity to novelty and cue-induced reward.
- B. YouTube’s own internal documents acknowledge that notifications make YouTube addictive: “Notifications are a critical part of YouTube and contribute to addiction. Users are tempted to watch videos the moment they are uploaded[.]”²⁶⁷
- C. YouTube has applied its vast resources and tuned its algorithm to make notifications an effective tool for increasing user engagement, including by gathering data on and leveraging “Demographics..., Historical activity...,” “Notification type, Channel ID, Video ID [video popularity and topics],” “Watchtime and unique watches on the channel, subscribed?, [age of subscription],” and “Local hour-of-day, day-of-week, seconds-since-last-watch.”²⁶⁸

v. Uncertainty (How Likely):

- A. YouTube provides intermittent positive reinforcement, which promotes continued scrolling in a treasure-hunting fashion, looking to replicate the good feelings of a previous video with

²⁶⁴ GOOG-3047MDL-01608261 at *11 (produced natively).

²⁶⁵ GOOG-3047MDL-00874191 at *12 (produced natively).

²⁶⁶ GOOG-3047MDL-02113187 at *5, 8, 27 (produced natively).

²⁶⁷ GOOG-3047MDL-00874191 at *13 (produced natively).

²⁶⁸ GOOG-3047MDL-02113187 at *42 (produced natively).

the promise of something similar and potentially more rewarding in the future.

- B. YouTube documents attest, “Unpredictable rewards are disproportionately delightful compared to predictable rewards because they’re unexpected or exceed expectations (e.g., finding a new favorite song while in a mix).”²⁶⁹ And “[w]hen thinking about habit building around YouTube, it is important that we reliably fulfill their goal pursuits (reliable reward) while also providing surprising nuggets of reward (variable reward). Ultimately you’re giving people more reasons to come back until they can’t even remember why they did. When is the last time you had a goal in mind when you went to Facebook?...We (YouTube) tend to excel at the surprise and not as much at the reliable, with exceptions.”²⁷⁰
 - C. In further discussing how to make YouTube more ‘habitual,’ YouTube internal documents elaborate on the importance of having both reliable and variable rewards, which YouTube provides: “It’s important to both provide for low risk (e.g. predictable)/low reward and high risk (unpredictable)/high reward, to keep people coming back.... ‘pretty nature pics I take usually get me a handful of likes...it’s reliable’ [vs] ‘I’m gonna post this crazy pic of a dead whale...I wonder how poeple [sic] will respond?’ ‘I’m gonna watch House again because it’s entertaining [sic]enough for right now’ vs ‘I feel like browsing around for something exciting and new...’”²⁷¹
 - D. In an April 2018 internal slide deck titled “Digital Wellbeing: Teen Insights” reporting the results of a study of teen users, YouTube concluded that the combination of “variable recommendations” and lack of “stopping cues,” created an “infinite slot machine” for teen users.²⁷² The slide also noted “IT DOESN’T COST ANYTHING TO KEEP COMING BACK – EXCEPT YOUR TIME.”²⁷³
- f. **YouTube’s** internal documents provide evidence that its social media products lead to out of control use, continued use despite consequences, and withdrawal.

²⁶⁹ GOOG-3047MDL-01268284 at *9 (produced natively).

²⁷⁰ GOOG-3047MDL-01268284 at *9, see comments (produced natively).

²⁷¹ GOOG-3047MDL-01268284 at *12, see comments (produced natively).

²⁷² GOOG-3047MDL-04813572 at *27 (produced natively).

²⁷³ GOOG-3047MDL-04813572 at *27 (produced natively). (all capitalization in original)

- i. Out of Control use:
 - A. In a slide presentation entitled “YouTube Main App: Deep dive with Neal²⁷⁴ and Matthew,” on a slide labeled, “Vision: We aspire to create an app that is... Addictive: Our app experience should compel users to come back more and more often.”²⁷⁵
 - B. YouTube’s own internal documents note the “‘Just One More Video’ Effect”, which states how “very simple [it is] to watch an ongoing sequence of videos (autoplay)” that are “often followed by feelings of guilt.”²⁷⁶
 - C. YouTube’s own research reveals that “it’s a problem of volume.”²⁷⁷ “Once you watch a few of these, your feed might become concentrated w/ a high volume of content that repeat the same message. Example: Social Comparison video, which is OK on its own, but sometimes the Watch Next feed may have many more videos that repeatedly make negative social comparisons of physical features.”²⁷⁸
 - D. They highlight as examples of excessive watch time “repeating skewed norms,” “negative social comparisons of physical appearance” like “make your nose smaller because that’s better.”²⁷⁹
- ii. Consequential use:
 - A. Also in the “Teen Well-being,” slide deck, the YouTube authors attest that they have done their own “lit reviews & consultations with developmental experts” and concluded that users of their product can develop a “perception of reality” that is “distorted.”²⁸⁰ A ‘distorted’ body image is a core feature of body dysmorphic disorder and some eating disorders, which I have seen as negative sequelae in my clinical practice among teens who get addicted to social

²⁷⁴ YouTube CEO Neal Mohan. *See* Deposition of Fred Gilbert, February 20, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 212:15-213:14.

²⁷⁵ GOOG-3047MDL-00767071 at *10 (produced natively).

²⁷⁶ GOOG-3047MDL-04918852 at *7 (produced natively).

²⁷⁷ GOOG-3047MDL-01372609 at GOOG-3047MDL-01372618.

²⁷⁸ GOOG-3047MDL-01372609 at GOOG-3047MDL-01372620.

²⁷⁹ GOOG-3047MDL-01372609 at GOOG-3047MDL-01372618.

²⁸⁰ GOOG-3047MDL-01372609 at GOOG-3047MDL-01372618.

media, including YouTube. YouTube documents also verify the growing problem of social aggression and antisocial behavior being promoted on YouTube and created and consumed by teens.

- B. YouTube attests to how their social media product can be used initially to improve mood but then becomes the reason for worsened mood: “Videos are initially used for quick mood management, but result in excessive viewing,” leading to negative emotions such as “guilt”.²⁸¹ “Survey research suggests that video watching is a common technique for mood management. Respondents reported watching cat videos to be in a more positive mood more quickly. After one video is over, it is difficult to stop watching the videos. Ultimately, viewers experience feelings of guilt for spending so much time doing non-meaningful tasks.”²⁸² This description captures the way in which addictive social media, initially alleviate negative emotions due to their rewarding properties, but ultimately contribute to negative emotions, due to regret, opportunity costs, and neuroadaptations (the dopamine deficit state).
- C. YouTube uses the graphic below,²⁸³ referenced to Howard 2012,²⁸⁴ and Gunantillake, 2017.²⁸⁵

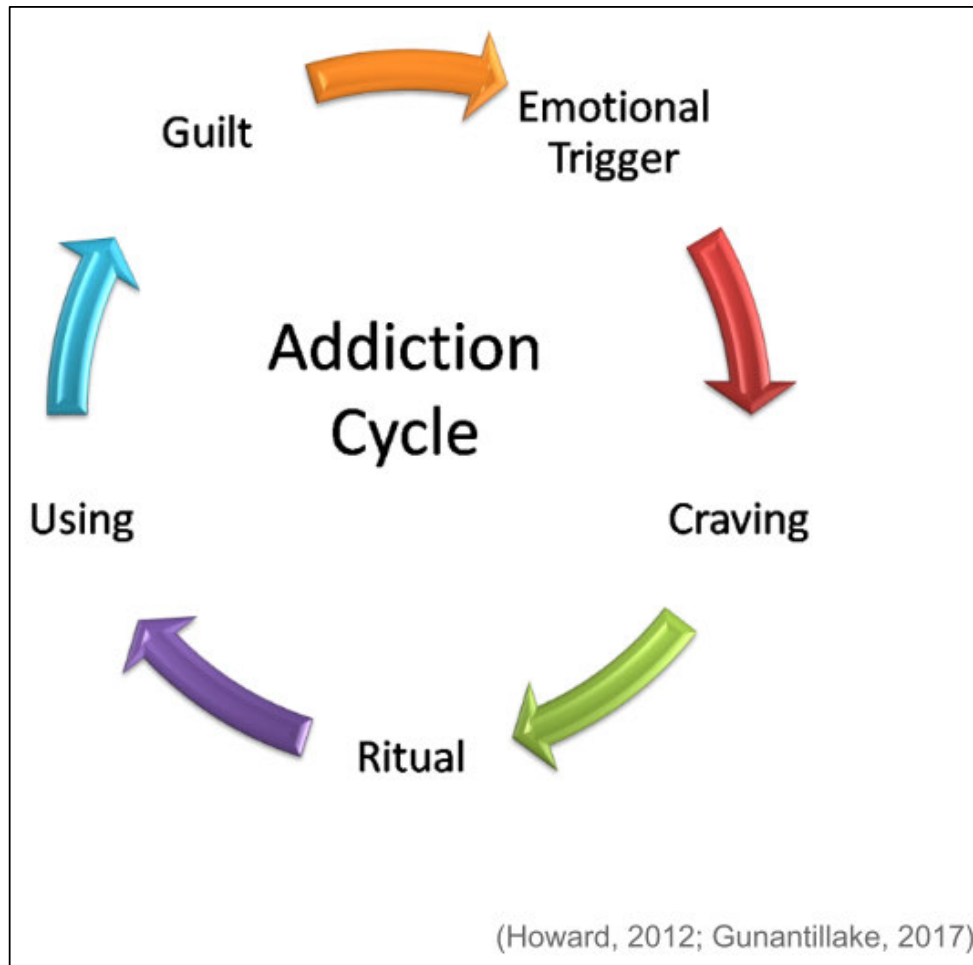
²⁸¹ GOOG-3047MDL-00874191 at *10 (produced natively).

²⁸² GOOG-3047MDL-00874191 at *10 (produced natively).

²⁸³ GOOG-3047MDL-00874191 at *12 (produced natively).

²⁸⁴ See Howard-Jones, P. (2011). Impact of digital technologies on human well-being. *Nominet Trust Presentation*.

²⁸⁵ See Gunantillake, R. (2016). What if tech tried to be healing instead of just addictive? *The Guardian*.



- D. YouTube’s internal documents state that watching videos contributes to a sedentary lifestyle, and in turn, “Reduces interest in hobbies and activities outside of the home.”²⁸⁶ Turning away from hobbies and other activities is sometimes referred to as *opportunity costs* and is one of the many harms of social media addiction.
- E. YouTube’s internal documents highlight how watching YouTube can contribute to “decreased attention spans”²⁸⁷ and hypothesizes that inattention, or cognitive deficits are related to the fact that “Electronic media exposure is fast-

²⁸⁶ GOOG-3047MDL-00874191 at *15 (produced natively).

²⁸⁷ GOOG-3047MDL-00874191 at *18 (produced natively).

paced[.]Changes focus rapidly and grabs viewer’s attention[.] Makes it difficult to pay attention in less-stimulating settings (i.e. work, school)[.]”²⁸⁸ This statement points to a related harm of problematic YouTube use among kids, which is its negative impact on school performance.

- F. YouTube’s internal documents acknowledge that “Blue-light from screens causes sleep deprivation; ultimately affects the brain’s mental processing,” and can result “in lower academic performance in students/teens.”²⁸⁹
- G. YouTube’s internal documents describe how YouTube can lead to “impulsive behaviors,” “distraction,” “procrastination,” and is “problematic for self-learning.”²⁹⁰ YouTube has promoted its platform as helping with learning,²⁹¹ but YouTube documents admit that “schools block Facebook because it’s not educational.”²⁹² Nonetheless, the YouTube EDU project is geared toward increasing “watch time”: “More EDU content = More watch time per user.”²⁹³ I have not seen evidence that YouTube EDU promotes learning. “More than 70% of schools in the US block YouTube” in 2012, and yet YouTube categorize this fact under “Problems we’re trying to solve,”²⁹⁴ despite its own findings that YouTube interferes with learning and promotes distraction and procrastination.
- H. YouTube’s documents acknowledge how users of social media can come to “rely on videos & social media for companionship,” and how “Social isolation is a growing problem due to increased interaction with technology.”²⁹⁵ These statements draw a clear parallel between the harms of addictive substances and addictive social media. In both cases, heavy, regular use leads to social isolation where the drug, including social media, comes to replace companionship, leading to further isolation. Social media can create the illusion of social connection even when no healthy connections are happening.

²⁸⁸ GOOG-3047MDL-00874191 at *19 (produced natively).

²⁸⁹ GOOG-3047MDL-00874191 at *22 (produced natively).

²⁹⁰ GOOG-3047MDL-00874191 at *28 (produced natively).

²⁹¹ GOOG-3047MDL-00665175.

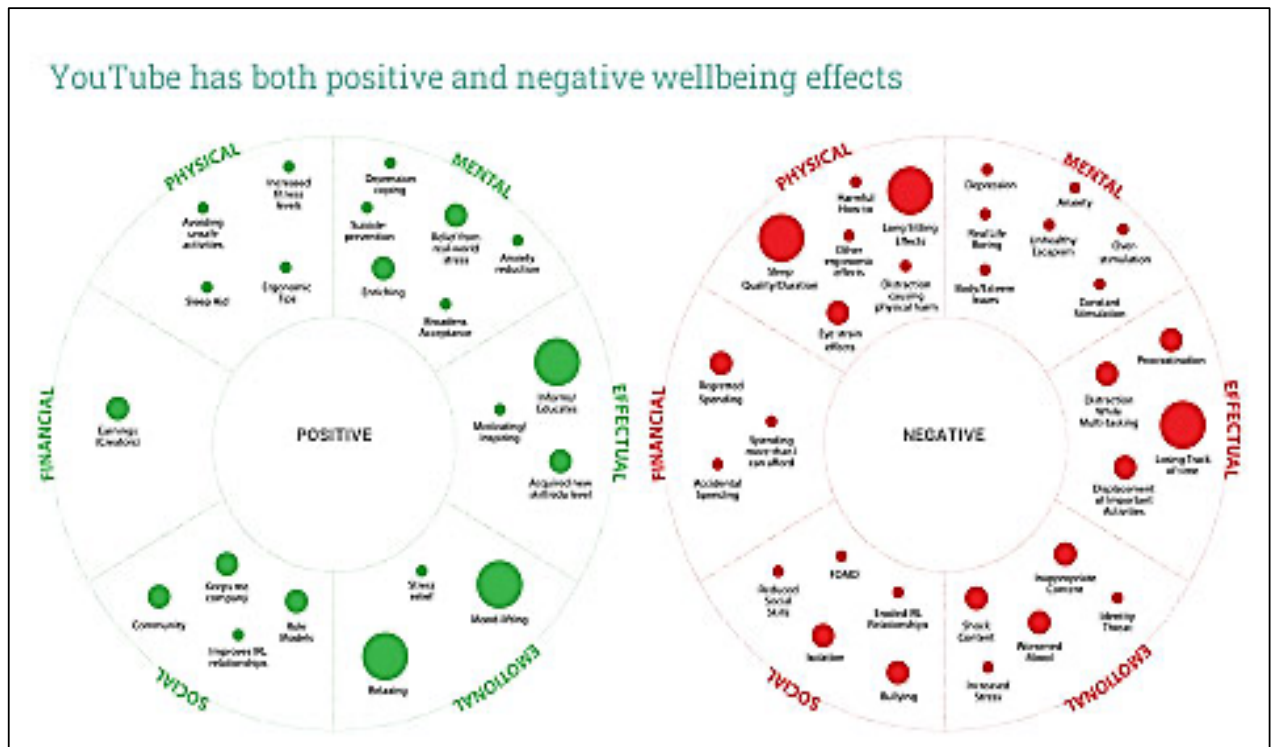
²⁹² GOOG-3047MDL-00665175 at *7 (produced natively).

²⁹³ GOOG-3047MDL-00665175 at *16 (produced natively).

²⁹⁴ GOOG-3047MDL-00665175 at *4 (produced natively).

²⁹⁵ GOOG-3047MDL-00874191 at *24 (produced natively).

- I. YouTube’s internal documents state that “Increasing number [sic] of children” are “in therapy after watching [YouTube].”²⁹⁶ YouTube documents based on their internal research show that the negative effects of watching YouTube are many and appear to outweigh the positive effects in a substantial population of users.²⁹⁷



- iii. Tolerance/Withdrawal: As discussed previously in this Report, continued engagement with an addictive medium is driven in part by neuroadaptation to the stimulus which contributes to tolerance and withdrawal, also known as ‘wanting but not liking.’ YouTube’s internal documents describe the “FOMO” generated by YouTube as, “Young adults suffer anxiety from ‘FOMO.’”²⁹⁸ FOMO is akin to withdrawal.
- iv. Wellbeing: YouTube has given lip-service to creating a product that is safer for teens, but has invested few resources into measuring wellbeing or the impact of “digital wellbeing breaks” and “bedtime reminders.”²⁹⁹

²⁹⁶ GOOG-3047MDL-00874191 at *29 (produced natively).

²⁹⁷ GOOG-3047MDL-00236723 at *6 (produced natively).

²⁹⁸ GOOG-3047MDL-00874191 at *28 (produced natively).

²⁹⁹ GOOG-3047MDL-02486605; GOOG-3047MDL-01714567 at *28 (produced natively).

- g. **TikTok** exploits behavioral reward mechanisms with its addictive and unsafe social media products targeted at kids.
 - i. Access (How Easy):
 - A. TikTok began as a social media app for kids³⁰⁰ and continues to pursue kids as a key demographic.
 - B. TikTok deployed resources to explore “What fuels [TikTok] usage and adoption in High Schools.”³⁰¹
 - C. TikTok makes it easy for youth consumers to access its social media platforms. There is no age verification process, so anyone at any age can access TikTok. TikTok’s own documents reveal that “Up to 70% of L1 users [aged 14 and under] report their age as 18+ when prompted to give their age via the age-gate feature.”³⁰² Using other apps and platforms like Google, Facebook, and Instagram, kids under 13 could access the full 18-plus experience on TikTok.³⁰³
 - D. TikTok admits “TikTok is distinct among its industry peers for its appeal to minors but we currently have no reliable way to identify which users are minors and to push them appropriate content.”³⁰⁴
 - E. The majority (58.6%) of TikTok users are 14 years of age and younger.³⁰⁵
 - i. Quantity (How Much):
 - A. TikTok defaults to endless scroll and autoplay on all of its platforms, creating a forced abundance.

³⁰⁰ TIKTOK3047MDL-056-00965196 at TIKTOK3047MDL-056-00965197; *see also* Deposition of Andrew Kirchhoff, March 16, 2025, In re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 82:15-83:1 (“[TikTok] basically just acquired musical.ly’s user base, which, as I mentioned was seven to 12 [aged] female.”).

³⁰¹ TIKTOK3047MDL-002-00077325 at TIKTOK3047MDL-002-00077326; *see also* Deposition of Andrew Kirchhoff, March 16, 2025, In re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 164:1-169:21.

³⁰² TIKTOK3047MDL-002-00085753 at TIKTOK3047MDL-002-00085759.

³⁰³ Deposition of Reagan Maher, February 21, 2025, In re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 68:25-69:20.

³⁰⁴ TIKTOK3047MDL-004-00147779 at TIKTOK3047MDL-004-00147787.

³⁰⁵ TIKTOK3047MDL-004-00290586.

- B. TikTok’s own documents attest that “The TikTok product experience utilizes many coercive design tactics that detract from user agency such as infinite scroll, constant notifications, and the ‘slot machine’ effect.”³⁰⁶ It also acknowledged that “powerful coercive design tactics...tend to benefit companies and advertiser more than users.”³⁰⁷
- ii. Potency (How Strong):
- A. TikTok is a short-form, highly potent, interactive, mobile-phone-adapted, social media video platform with many addictive design features built in as default modes.
 - B. The *posts, likes, shares, comments*, and *view counts* promote social validation, enhance reputation, and create in-group/out-group comparisons.
 - C. The TikTok’s algorithm optimizes for ongoing engagement, including time spent as a core metric, promoting ‘rabbit holes’ that make it difficult to disengage even when the user wants to.
 - D. A study published in *Neuroimage* looked at brain activation in response to “personalized recommended [TikTok] videos for experienced users” compared to “generalized recommended videos for new users,” and found that Tik Tok videos that are personalized for the user compared to non-personalized TikTok videos activated the brain’s reward pathway, also known as the ventral tegmental area (VTA).³⁰⁸ The authors concluded, “... these findings may suggest that (1) the DMN [default mode network] activation and its enhanced coupling to visual and auditory pathways may contribute to the problematic TikTok use through modulations of attention and high-level perception, (2) the regions with decreased DMN coupling, precuneus and cingulate cortex, may involve in self-control, and thus decreased coupling with these areas may lead to loss-of-control use, and (3) the higher activation of VTA [ventral tegmental area, i.e. the reward pathway] might

³⁰⁶ TIKTOK3047MDL-006-00327425 at TIKTOK3047MDL-006-00327435.

³⁰⁷ TIKTOK3047MDL-006-00327425 at TIKTOK3047MDL-006-00327444.

³⁰⁸ Su, C., Zhou, H., Gong, L., Teng, B., Geng, F., & Hu, Y. (2021). Viewing personalized video clips recommended by TikTok activates default mode network and ventral tegmental area. *NeuroImage*, 237, 118136. <https://doi.org/10.1016/j.neuroimage.2021.118136>

associate with a higher level of value-based representations for personalized videos.”³⁰⁹

- E. The algorithmic feed that targets TikTok videos to the individual users is more rewarding than a non-targeted feed and thereby contributes to the problem of social media addiction. TikTok’s own internal documents assert, “A non personalized [sic] feed provides users a way to escape unwanted rabbit holes and enhanced data privacy for users.”³¹⁰
- F. TikTok Live, real-time, livestreamed videos, allow for the exchange of monetary rewards for content creators from viewers, and for viewers from content creators.³¹¹ In response to the feature of vouchers for viewers who stay on the platform longer, TikTok’s internal documents note the risks for kids: “Concerned since the vouchers are being used to incentivize uses to stay longer on lives this goes against some of our risks for minors.”³¹²

iii. Novelty (How New):

- A. TikTok uses notifications to alert consumers of new incoming content, which primes users to feel a compulsion to check TikTok even when their attention is directed elsewhere.³¹³ TikTok relies on many different types of notifications, including:
- B. “Interest Push: Suggests a post the user might be interested in to get them to open the app;”³¹⁴
- C. “Ops Push: Notifies a users [sic] of trending content and encourages them to view the video or create similar content;”³¹⁵

³⁰⁹ Su, C., Zhou, H., Gong, L., Teng, B., Geng, F., & Hu, Y. (2021). Viewing personalized video clips recommended by TikTok activates default mode network and ventral tegmental area. *NeuroImage*, 237, 118136. <https://doi.org/10.1016/j.neuroimage.2021.118136>

³¹⁰ TIKTOK3047MDL-002-00091621 at TIKTOK3047MDL-002-00091626.

³¹¹ See Deposition of Reagan Maher, February 21, 2025, In re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 87:21-88:15.

³¹² TIKTOK3047MDL-021-LARK-00005437-TIKTOK3047MDL-021-LARK-00005440.

³¹³ See Deposition of Andrew Kirchhoff, March 16, 2025, In re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 271:14-274:17, 277:6-278:23.

³¹⁴ TIKTOK3047MDL-004-00291835-TIKTOK3047MDL-004-00291836.

³¹⁵ TIKTOK3047MDL-004-00291835-TIKTOK3047MDL-004-00291836.

- D. “Post Push: Notifies a user when someone they follow posts new content;”³¹⁶
 - E. “Live Push: Notifies a user when someone they follow goes LIVE;”³¹⁷
 - F. “Comments/Like/Interact: Notifies the user every time a friend comments, likes, or interacts with their post.”³¹⁸
 - G. As previously stated, TikTok’s own documents attest that “The TikTok product experience utilizes many coercive design tactics that detract from user agency such as infinite scroll, constant notifications, and the ‘slot machine’ effect.”³¹⁹
- iv. Uncertainty (How Likely):
- A. The TikTok algorithmic feed is designed for uncertain rewards. Users continue to scroll in a treasure-hunting fashion, looking to replicate the good feelings of a previous video with the promise of something similar yet different and potentially more rewarding in the future.
 - B. As TikTok’s own documents attest, this creates a “slot machine” effect.³²⁰
- h. **TikTok**’s own documents provide evidence that its social media products lead to out of control use, compulsive use, and continued use despite consequences.
- i. Out of Control Use:
- A. According to TikTok’s internal documents, “TikTok’s success can largely be attributed to strong out of the box personalization and automation, which limits user agency [sic]. TikTok is particularly popular with younger users, who are particularly sensitive to reinforcement in the form of social reward and have minimal ability to self-regulate effectively.”³²¹

³¹⁶ TIKTOK3047MDL-004-00291835-TIKTOK3047MDL-004-00291836.

³¹⁷ TIKTOK3047MDL-004-00291835-TIKTOK3047MDL-004-00291836.

³¹⁸ TIKTOK3047MDL-004-00291835-TIKTOK3047MDL-004-00291836.

³¹⁹ TIKTOK3047MDL-006-00327425 at TIKTOK3047MDL-006-00327435.

³²⁰ TIKTOK3047MDL-006-00327425 at TIKTOK3047MDL-006-00327435; *see also* Deposition of Jordan Furlong, Volume I, April 11, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 92:10-15.

³²¹ TIKTOK3047MDL-002-00091634 at TIKTOK3047MDL-002-00091639.

- B. TikTok’s own research shows that TikTok users ascribe their difficulty controlling TikTok use to the addictive design features of the medium. As stated in internal TikTok documents, “Participants’ challenges with effectively managing their time on TikTok were the same as why they enjoyed and used TikTok. Namely, TikTok reliably delivered highly engaging, quick, and continuous content. Other aspects of TikTok that contributed to participants’ challenges with managing their time included the continuous scroll, few or no breaks between content, short videos, and not knowing what the next video will be.”³²² This statement by TikTok highlights some of the design features outlined previously in this Report that make TikTok addictive: Quantity (“continuous scroll”), potency (“short videos”), and uncertainty (“not knowing what the next video will be”).
- C. TikTok’s internal documents demonstrate that a primary problem with TikTok is “Users often spend longer on the app than they want to in a session.”³²³ Citing Common Sense Media and Europe PMC as follows, TikTok documents reveal, “We have learned from Project Who that our users’ biggest usage deterrent is that they think the platform is addictive. According to a study of 1600 8-18 year olds, 8-12 year olds use almost 5 hours of entertainment screen media per day and teens use just over 7 hours per day, with 62% over 4 hours and 29% over 8 hours (Common Sense Media)[.]. Compulsive usage interferes with essential personal responsibilities like sufficient sleep, work/school responsibilities, and connecting with loved ones (Europe PMC)[.]”³²⁴
- D. Internal TikTok documents reveal that TikTok deployed its own metric for excessive (likely addictive) use, which they call “unbalanced” use based on their “Balance Engagement Index.”³²⁵ The express goal of this index is “reduction in problematic screen time,”³²⁶ indicating that use of TikTok can be ‘problematic’ due to excessive screen time.

³²² TIKTOK3047MDL-002-00101574 at TIKTOK3047MDL-002-00101581.

³²³ TIKTOK3047MDL-001-00060515 at TIKTOK3047MDL-001-00060518.

³²⁴ TIKTOK3047MDL-001-00060515 at TIKTOK3047MDL-001-00060518; *see also* Deposition of Jordan Furlong, Volume I, April 11, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), 257-13:260:19.

³²⁵ TIKTOK3047MDL-197-04799946

³²⁶ TIKTOK3047MDL-197-04799946

- E. TikTok’s Balance Engagement Index (BEI) is equal to “1-Unbalanced Engagement Rate,” where unbalanced engagement rate is measured in different ways, including time spent on the platform.³²⁷ TikTok’s research reveals that 40.5% of minors “hit the excessive duration limit and 22% of them hit the night duration limit,” where “Excessive users are users who continuously use TikTok for more than 80 mins at day or more than 60 mins at night.”³²⁸ TikTok refers to these individuals as “binge users,”³²⁹ borrowing from the language of addiction, where a ‘binge drinker’ is someone who uses large quantities of alcohol within a discrete period of time.
 - F. TikTok’s research found that 6.95% of active minors at nighttime are excessive users, and 4.18% of active minors at daytime are excessive users,³³⁰ which translates to 900,000 teens using TikTok excessively at nighttime (6.95% of 13 million), and 500,000 during the day (4.18% of 13 million).³³¹
- ii. Compulsive use:
- A. TikTok’s own documents use the language of “compulsive use” of their platform in a document entitled “Digital Wellbeing Research Repository”: “Are there any other unhealthy behaviors we might want to stop? Compulsive trolling? Compulsive posting of videos (which can be far more time consuming than what we see in the app)? Compulsive reading of comments, including H&B comments, compulsively seeking feedback? (I’m just brainstorming - would love some real data from our users/experts.)”³³²
 - B. Later in the same document, TikTok lists “Compulsive usage” alongside “Algo/content management” as one of the

³²⁷ TIKTOK3047MDL-197-04799946 at TIKTOK3047MDL-197-04799948.

³²⁸ TIKTOK3047MDL-197-04799946 at TIKTOK3047MDL-197-04799949; *see* Deposition of Jordan Furlong, Volume II, April 12, 2024, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 441:19-442:16.

³²⁹ TIKTOK3047MDL-197-04799946 at TIKTOK3047MDL-197-04799951.

³³⁰ TIKTOK3047MDL-197-04799946 at TIKTOK3047MDL-197-04799949; *see also* Deposition of Jordan Furlong, Volume II, April 12, 2024, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 442:17-443:1.

³³¹ 21 million teens aged 13-17 in the United State. OJJDP Statistical Briefing Book. Online. Available: <https://ojjdp.ojp.gov/statistical-briefing-book/population/faqs/QA01104>. Released on 10/13/2021. 63% of United States Teens aged 13-17 use TikTok. Faverio, M., Sidoti, O., & Pew Research Center. (2024). Teens, Social Media and Technology 2024. In Pew Research Center. <https://www.pewresearch.org>, at p. 3.

³³² TIKTOK3047MDL-002-00101574

“Problems” TikTok is facing.³³³ And “Compulsive checking - inconsistent rewards create a trigger-reward-engage cycle.”³³⁴

iii. Consequential use:

- A. TikTok’s internal documents describe the negative consequences of TikTok: “Participants were largely motivated to manage their time on TikTok to mitigate TikTok’s interference with their obligations and productivity (e.g., work, school, household duties, and sleep). Participants were also motivated by experiencing negative emotions after overusing TikTok (e.g., guilt, disappointment, etc.) and witnessing the challenges that others around them experienced with effectively managing their time on TikTok.”³³⁵ These harms of TikTok are consistent with harms seen with addiction to drugs and alcohol, namely interference with “obligations and productivity” extending into many different life domains, from “work, school, household duties, sleep” to mental health consequences of increased negative emotions.³³⁶
- B. TikTok’s internal documents describe the case of a TikTok user whose TikTok’s algorithmic feed repeatedly pushed content related to obsessive checking behavior, requiring that individual to seek out professional psychiatric treatment leading to a diagnosis of obsessive compulsive disorder (OCD): “A young person with undiagnosed obsessive compulsive disorder started watching videos of people doing checking behaviours (tidying things, straightening rows, making beds with neat edges etc). None of it was violative or problematic for the majority of viewers. The more he watched, the more he got served. He got caught in a loop and, following his diagnosis, had to come off TikTok. The young person wants to come back on to TikTok and asks for a reset button so he can leave his problematic viewing behind.”³³⁷ In this case, the design features of the platform led to significant harm necessitating professional treatment.
- C. TikTok’s response to this problem was a “reset button” or a “shakeup button,” but as one TikTok engineer aptly

³³³ TIKTOK3047MDL-002-00101574 at TIKTOK3047MDL-002-00101577.

³³⁴ TIKTOK3047MDL-002-00101574 at TIKTOK3047MDL-002-00101580.

³³⁵ TIKTOK3047MDL-002-00101574 at TIKTOK3047MDL-002-00101581.

³³⁶ See Deposition of Jordan Furlong, Volume I, April 11, 2024, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 230:8-232:7.

³³⁷ TIKTOK3047MDL-002-00075240

responded, a reset button was unlikely to solve the problem because the TikTok algorithm is designed to lead the user down the same addictive rabbit hole: “Hi@Alexandra Evans@Jordan Furlongjust [sic] wondering - are we planning to include some sort of mechanism to prevent algorithmic recidivism? If the content engaged them the first time around, it might do so again and opens up the possibility of a repeat user journey, which might lower feature efficacy?”³³⁸

- D. TikTok’s internal documents detail the case of teen girls whose TikTok feeds led to the girls making negative comparisons between themselves and the curated images on TikTok: “Three 17 year-old girls in Ireland described how during the first lockdown they, their friends and their younger sisters had started watching videos showing ways to keep fit. The more they watched, the more they saw and they also began to be served videos for related topics such as healthy eating. As their feed honed in on this theme, they increasingly felt a sense of failure f/inadequacy they weren't as motivated, happy or as perfect as the creators in the video. The young people said they wanted our 'Not Interested' button to be more detailed and more responsive, for example, 'Never show me again', 'Show me a lot less' 'Show me a bit less' 'Show me more' 'Show me lots more'. This would enable them to decide the right balance for them.”³³⁹
- E. This demonstrates how an addictive medium like TikTok is difficult to stop using, even when the users recognize that it makes them feel worse, getting back to the age-old theme in addictive disorders of ‘wanting but not liking’: As the brain changes in response to the addictive behavior, it’s difficult to stop using, even when no longer pleasurable. These girls’ request for a more powerful ‘not interested button’ is met with comments by TikTok indicating that their algorithm is addictive by design: “The allegation is we control the algo and therefore we control the user. These suggestions [to “Enhance our ‘Not interested button’”] reverse the narrative - the user controls the algo and we have given them the tools to do so. The idea that we create harmful rabbit holes from which users can't escape would be easy to rebut.”³⁴⁰ TikTok appears to acknowledge here that their algorithm does indeed “control

³³⁸ TIKTOK3047MDL-002-00075240

³³⁹ TIKTOK3047MDL-002-00075240 at TIKTOK3047MDL-002-00075241.

³⁴⁰ TIKTOK3047MDL-002-00075240 at TIKTOK3047MDL-002-00075241

the user”³⁴¹ and that TikTok has the ability to engineer design changes to make their product less addictive, if it chooses to. On May 16, 2023, TikTok did implement an algorithm reset button.³⁴²

- F. TikTok’s own internal documents acknowledge the harmful impact of their social media products’ addictive design features like notifications on kids’ sleep: “In addition to disrupting the necessary ~8 hours of sleep teens need, research has found that the compulsion to react to notifications at night can result in lower quality sleep. This impacts our minor users significantly when coupled with the fact that they are still developing impulse control and executive function and may struggle to restrict themselves from night-time phone use.”³⁴³ This statement also shows that TikTok is aware of the unique vulnerability of kids’ brains.

iv. Wellbeing:

- A. Fifty-nine percent of TikTok users endorse needing a screen time management tool when it comes to TikTok, but only 37% are aware that the tools exist, and less than 1% report actual usage.³⁴⁴
- B. But TikTok’s internal documents reveal that the features added by TikTok to protect kids from social media addiction take a back seat to TikTok’s core metrics, namely time spent on the platform and profitability.
- C. Numerous documents make clear that, “guardrails” were implemented to ensure limited impacts on core metrics like stay time of users.³⁴⁵ As such, it appears that TikTok’s well-being features serve to burnish TikTok’s public image, including combatting the widespread and well-founded public perception that TikTok is addictive, without changing what makes TikTok addictive for kids.

³⁴¹ TIKTOK3047MDL-002-00075240 at TIKTOK3047MDL-002-00075241

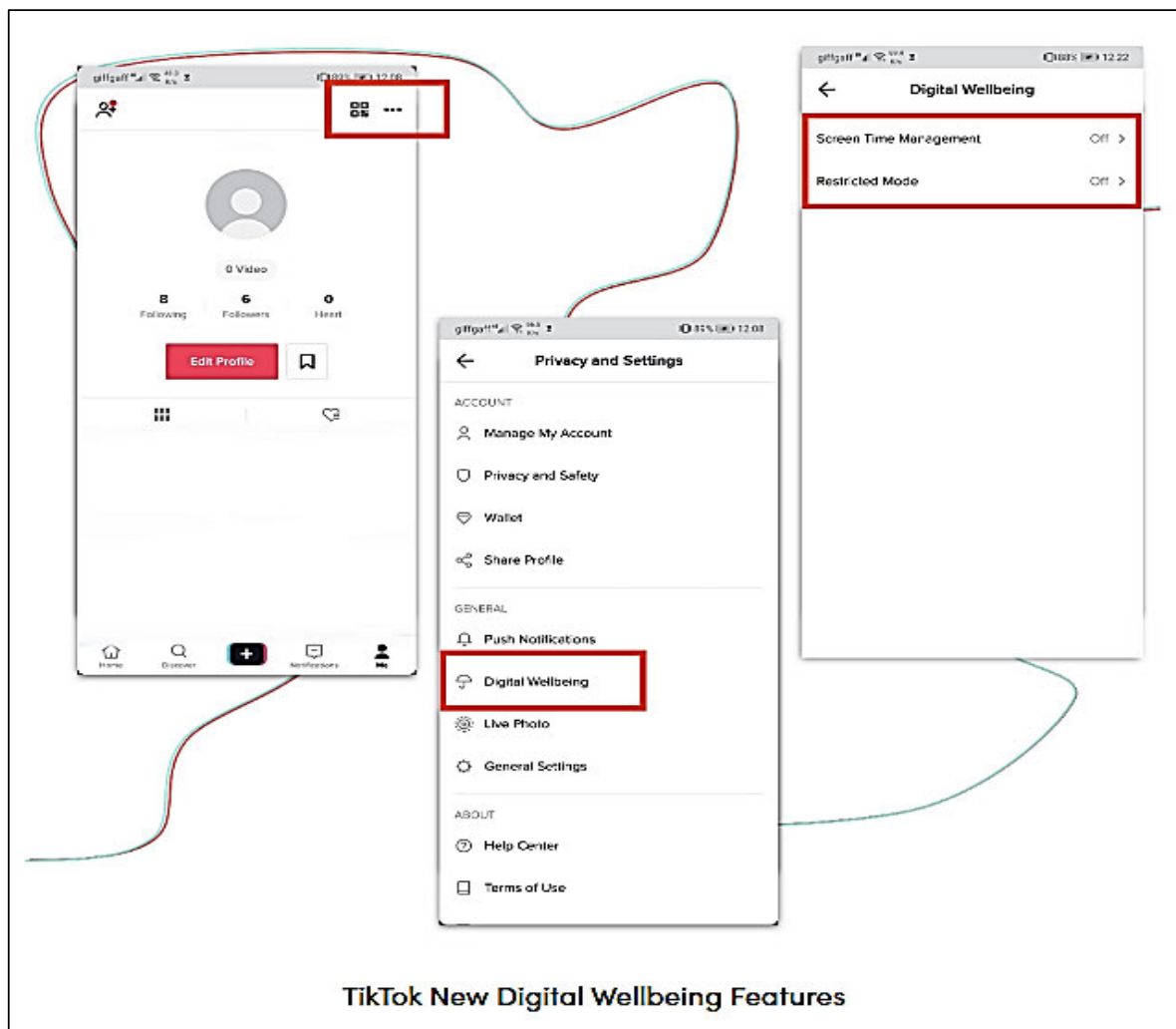
³⁴² TIKTOK3047MDL-112-04265616

³⁴³ TIKTOK3047MDL-002-00101838 at TIKTOK3047MDL-002-00101842; *see also* Deposition of Jordan Furlong, Volume II, April 12, 2024, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), Exhibit 64 (“...minors do not have executive function to control their screen time...”).

³⁴⁴ TIKTOK3047MDL-002-00098058 at TIKTOK3047MDL-002-00098060.

³⁴⁵ TIKTOK3047MDL-004-00323151; TIKTOK3047MDL-002-00098058 at TIKTOK3047MDL-002-00098060; TIKTOK3047MDL-001-00060515 at TIKTOK3047MDL-001-00060520.

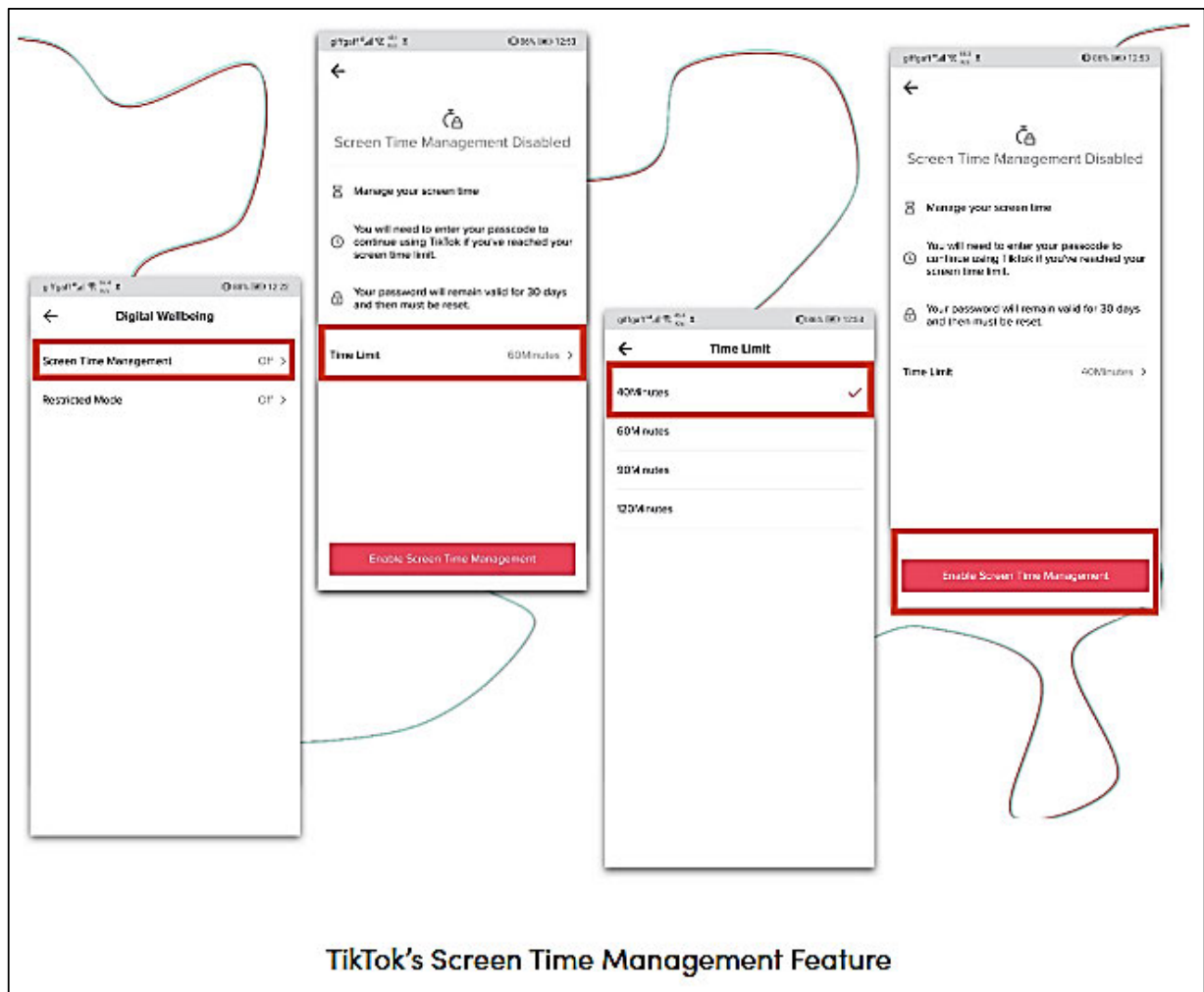
- D. Accessing TikTok's time management feature requires navigating a byzantine series of screens, see below,³⁴⁶ in contrast to TikTok's landing page, which TikTok has made as frictionless as possible.³⁴⁷ Further, TikTok's time management features are optional and users, including minors, can opt out.³⁴⁸



³⁴⁶ TikTok (2019, April 9) NEW! Screen Time Management and Restricted Mode Features on TikTok. TikTok Newsroom. <https://web.archive.org/web/20220329025835/https://newsroom.tiktok.com/en-gb/new-screen-time-management-and-restricted-mode-features-on-tiktok/>

³⁴⁷ TIKTOK3047MDL-036-LARK-00170056 at TIKTOK3047MDL-036-LARK-00170062.

³⁴⁸ TIKTOK3047MDL-004-00323151; TIKTOK3047MDL-002-00098058 at TIKTOK3047MDL-002-00098060; TIKTOK3047MDL-001-00060515 at TIKTOK3047MDL-001-00060520; TIKTOK3047MDL-002-00090900.



- E. I am not aware of evidence showing that implementing TikTok's so-called wellbeing features have succeeded in combating addictive use or reducing time spent on the platform. TikTok's own research shows that their well-being interventions are having little or no impact: "Take a Break [also known internally as "Anti Addiction Videos"]³⁴⁹ are not effective enough as a screen time management intervention because users can bypass them simply by continuing to scroll.

³⁴⁹ Deposition of Jordan Furlong, Volume II, April 12, 2024, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), Exhibit 89 (TIKTOK3047MDL-068-LARK- 01057042 at TIKTOK3047MDL-068-LARK- 01057043).

We can see many comments mocking the feature and not taking it seriously because of this.”³⁵⁰

- v. Despite internally discussing the addictive nature of TikTok, TikTok executives Reagan Maher, TikTok Head of Investigations and Insights,³⁵¹ Amy Ulucay, ByteDance Head of Minor Safety Product,³⁵² Amber Burchell, Community Risk Control Program Manager,³⁵³ and Drew Kirchhoff, Data Scientist,³⁵⁴ never warned their youth consumers or their parents about the addictive potential of their products.³⁵⁵

5. Addiction to social media can adversely affect youth mental health, particularly among those with co-occurring psychiatric disorders. Conversely, limiting social media use can improve youth mental health. While some users may benefit from social media, such benefit does not negate the harm caused to a substantial population of users.

- a. Youth with emotional distress are more vulnerable to social media addiction and related harms than youth without. Psychiatric symptoms and emotional distress can increase the risk of social media addiction.³⁵⁶ One mechanism by which this may occur is through self-medication, that is the attempt to alleviate psychiatric symptoms and psychological distress by using mood enhancing drugs and behaviors. But addictive drugs and behaviors most often make the individual’s psychiatric disorder worse in the long term.³⁵⁷

³⁵⁰ TIKTOK3047MDL-002-00091546 at TIKTOK3047MDL-002-00091552.

³⁵¹ Deposition of Reagan Maher, February 21, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), Exhibit 2.

³⁵² Deposition of Amy Ulucay (Classen), Volume I, February 5, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), Exhibit 1.

³⁵³ Deposition of Amber Renee Miller Burchell, December, 18, 2024, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), Exhibit 3.

³⁵⁴ Deposition of Andrew Kirchhoff, March 16, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), Exhibit 2.

³⁵⁵ Deposition of Amy Ulucay (Classen), Volume I, February 5, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 169:4-7; Deposition of Reagan Maher, February 21, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 109:21-110:6; Deposition of Amber Renee Miller Burchell, December 18, 2024, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 109:23-110:4; Deposition of Andrew Kirchhoff, March 16, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 268:8-269:25.

³⁵⁶ Schou Andreassen, C., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., & Pallesen, S. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. *Psychology of addictive behaviors : journal of the Society of Psychologists in Addictive Behaviors*, 30(2), 252–262. <https://doi.org/10.1037/adb0000160>.

³⁵⁷ Lembke A. (2012). Time to abandon the self-medication hypothesis in patients with psychiatric disorders. *The American journal of drug and alcohol abuse*, 38(6), 524–529. <https://doi.org/10.3109/00952990.2012.694532>³⁵⁸
Danish Competition and Consumer Authority. (2025). Young consumers and social media.

- b. That kids with emotional distress and psychiatric symptoms are more likely to develop social media addiction does not negate the fact that social media are addictive and therefore harmful.
- c. Although youth with emotional distress are more vulnerable to the harms of social media, the social medium itself confers greater risk than users' individual characteristics.
 - i. In a Danish survey study of social media addiction, the authors found that "Despite the importance of individual characteristics, overuse seemed to show a stronger relationship with the product than with the user. The analysis revealed that the tendency to over-use was far more prevalent among individuals who use social media mainly for viewing content (e.g., TikTok and Instagram) than among those who use social media mainly for chatting (e.g., Messenger and Discord)."³⁵⁸
 - ii. This finding highlights the important distinctions among different types of social media and their risk-benefit ratios.
- d. My clinical experience has demonstrated that some patients who come to clinic seeking help for depression anxiety, insomnia, and other mental health symptoms are consuming social media in high volumes. In my opinion, social media is often a substantial contributing factor to their poor mental health.
 - i. When these individuals give up or reduce their high-volume use of social media long enough for their brains to adjust to the loss of the high-stimulus reward--on average four weeks--the majority experience significant improvement in psychiatric symptoms independent of any other psychiatric treatment or intervention.
 - ii. This improvement is similar to the long-term improvements seen in mood and functioning in addicted patients who abstain for long enough from addictive drugs like alcohol, opioids, cannabis, and nicotine.
- e. A growing body of literature shows that excessive use of social media can contribute to psychological and physical health harms in youth. These studies are heterogeneous in design and outcome and generally do not distinguish high and low-risk groups, thereby insufficiently appreciating the increased risk to vulnerable youth.

<https://www.em.dk/Media/638744252848589136/KFST%20analyse%20-%20Young-consumers-and-social-media.pdf>, at p.6.

³⁵⁸ Danish Competition and Consumer Authority. (2025). Young consumers and social media.

<https://www.em.dk/Media/638744252848589136/KFST%20analyse%20-%20Young-consumers-and-social-media.pdf>, at p.6.

- f. There are several studies looking at the impact of reducing or stopping social media.
 - i. A recent meta-analysis by Ferguson claims that reductions in social media use have no impact on mental health, “meta-analytic evidence for causal effects was statistically no different than zero.” This study, however, fails to separate out studies which were too short in duration to meaningfully account for the acute withdrawal after abrupt cessation of social media use, in which mental health symptoms would be expected to be worse.³⁵⁹
 - ii. A re-analysis of the same data by Thrul et al, separating out studies based on duration of cessation of social media use, found “that interventions of less than 1 week resulted in significantly worse mental health outcomes ($d=-0.168$, $SE=0.058$, $p=.004$), while interventions of 1 week or longer resulted in significant improvements ($d=0.169$, $SE=0.065$, $p=.01$). Analyses of intervention length as continuous moderator included $k=19$ studies and showed significant quadratic effects for number of weeks ($b=-0.022$; $SE=0.008$; $z=-2.6$; $p<.01$), as well as number of days ($b=-0.001$; $SE=0.000$; $z=-2.5$; $p<.05$).
 - iii. These findings suggest that social media use reduction / abstinence interventions should have a minimum length of 1 week or longer to confer mental health benefits.”³⁶⁰
 - iv. In my clinical experience, 3-4 weeks of abstinence is necessary for patients to note psychiatric improvements after stopping social media use.
 - v. Davis and Goldfield experimentally examined the effects of reducing social media use on symptoms of depression, anxiety, fear of missing out (FOMO), and sleep, specifically in youth *with emotional distress*, an important distinction because of this subgroup’s vulnerability to the harms of social media compared with the general population.³⁶¹

³⁵⁹ Ferguson, C. J. (2024). Do social media experiments prove a link with mental health: A methodological and meta-analytic review. *Psychology of Popular Media*. Advance online publication. <https://doi.org/10.1037/ppm0000541>, at p. 1.

³⁶⁰ Thrul, J., Devkota, J., AlJuboori, D., Regan, T., Alomairah, S., & Vidal, C. (2025). Social media reduction or abstinence interventions are providing mental health benefits—Reanalysis of a published meta-analysis. *Psychology of Popular Media*, 14(2), 207–209. <https://doi.org/10.1037/ppm0000574>

³⁶¹ Davis, C. G., & Goldfield, G. S. (2025). Limiting social media use decreases depression, anxiety, and fear of missing out in youth with emotional distress: A randomized controlled trial. *Psychology of Popular Media*, 14(1), 1–11. <https://doi.org/10.1037/ppm0000536>

- vi. In a randomized controlled trial of 220 youth aged 17–25 years to either an intervention or control group, the intervention group was asked to reduce smartphone-based social media use to 1 hour per day for 3 weeks while the control group had no social media restrictions. Social media was tracked via objective measures.³⁶²
- vii. The researchers found that “Compared to the control group, the intervention group showed significantly greater reductions in symptoms of depression, anxiety, and FOMO, and greater increases in sleep. No effects of gender were detected. Reducing SMU on smartphones to approximately 1 hr/day may be a feasible, inexpensive, and effective method of increasing sleep and reducing symptoms of depression, anxiety, and FOMO among distressed youth.”³⁶³
- viii. A study of 143 University of Pennsylvania undergraduates who were randomly assigned to reduce their use of social media (Facebook, Instagram and Snapchat) to 10 minutes, per platform, per day, or to use social media as usual for three weeks, found that the group that limited their social media use showed significant reductions in loneliness and depression compared to the control group.³⁶⁴
- ix. Alcott and colleagues (2020) randomly assigned 2,743 adults to deactivate their Facebook accounts for one month or not.³⁶⁵ Those who deactivated Facebook experienced significantly improved well-being.³⁶⁶ The researchers relied on surveys, emails, text messages, and monitoring software to measure both subjective accounts and objective behavior of both groups, both during and after the experiment.³⁶⁷ The authors concluded, “We find that four weeks without Facebook improves subjective well-being and substantially reduces post-experiment demand, suggesting that forces such as addiction and

³⁶² Davis, C. G., & Goldfield, G. S. (2025). Limiting social media use decreases depression, anxiety, and fear of missing out in youth with emotional distress: A randomized controlled trial. *Psychology of Popular Media*, 14(1), 1–11. <https://doi.org/10.1037/ppm0000536>

³⁶³ Davis, C. G., & Goldfield, G. S. (2025). Limiting social media use decreases depression, anxiety, and fear of missing out in youth with emotional distress: A randomized controlled trial. *Psychology of Popular Media*, 14(1), 1–11. <https://doi.org/10.1037/ppm0000536>

³⁶⁴ Hunt, M. G., Marx, R., Lipson, C., & Young, J. (2018). No more FOMO: Limiting social media decreases loneliness and depression. *Journal of Social and Clinical Psychology*, 37(10), 751–768. <https://doi.org/10.1521/jscp.2018.37.10.751>

³⁶⁵ Allcott, H., Braghieri, L., Eichmeyer, S., & Gentzkow, M. (2020). The welfare effects of social media. *The American Economic Review*, 110(3), 629–676. <https://doi.org/10.1257/aer.20190658>

³⁶⁶ Allcott, H., Braghieri, L., Eichmeyer, S., & Gentzkow, M. (2020). The welfare effects of social media. *The American Economic Review*, 110(3), 629–676. <https://doi.org/10.1257/aer.20190658>

³⁶⁷ Allcott, H., Braghieri, L., Eichmeyer, S., & Gentzkow, M. (2020). The welfare effects of social media. *The American Economic Review*, 110(3), 629–676. <https://doi.org/10.1257/aer.20190658>

projection bias may cause people to use Facebook more than they otherwise would.”³⁶⁸

- x. A study by Abrahamsson (2024) conducted in Norway shows that banning smartphones in schools leads to reduced seeking for mental health care and an improvement in grade point average in girls.³⁶⁹ The author concludes, “My results show that banning smartphones leads to a significant decline at the intensive margin for the number of consultations related to diagnosis and treatment for psychological symptoms and diseases.”³⁷⁰
- xi. A study by Pawlowski (2021) and colleagues in Denmark explored the impact of banning smartphones in schools on kids’ level of physical activity.³⁷¹ From August to October 2020, children from grades 4–7 (10–14 years) at six Danish schools were banned from using their smartphones during recess for a four-week period.³⁷² The authors found “a significant increase in PA [physical activity] during recess—both in intensity and frequency—when a ban on smartphone usage was implemented for four weeks.”³⁷³
- g. I am familiar with the work of Jean Twenge, whom I understand to be an expert witness for plaintiffs in this litigation and will testify to her own research and findings regarding correlational studies. I find consistency between my own patients’ conditions and Dr. Twenge’s findings that heavy users of social media are more likely to be unhappy, depressed, or to have attempted suicide, than those with lesser social media use.³⁷⁴

³⁶⁸ Allcott, H., Braghieri, L., Eichmeyer, S., & Gentzkow, M. (2020). The welfare effects of social media. *The American Economic Review*, 110(3), 629–676. <https://doi.org/10.1257/aer.20190658>

³⁶⁹ Abrahamsson, S. (2024). Smartphone bans, student outcomes and mental health. In SAM (Discussion Paper No. 0804–6824; Vols. 01–24). <https://openaccess.nhh.no/nhh-xmlui/bitstream/handle/11250/3119200/DP%2001.pdf?sequence=1&isAllowed=y>

³⁷⁰ Abrahamsson, S. (2024). Smartphone bans, student outcomes and mental health. In SAM (Discussion Paper No. 0804–6824; Vols. 01–24). <https://openaccess.nhh.no/nhh-xmlui/bitstream/handle/11250/3119200/DP%2001.pdf?sequence=1&isAllowed=y>

³⁷¹ Pawlowski, C. S., Nielsen, J. V., & Schmidt, T. (2021). A Ban on Smartphone Usage during Recess Increased Children's Physical Activity. *International journal of environmental research and public health*, 18(4), 1907. <https://doi.org/10.3390/ijerph18041907>.

³⁷² Pawlowski, C. S., Nielsen, J. V., & Schmidt, T. (2021). A Ban on Smartphone Usage during Recess Increased Children's Physical Activity. *International journal of environmental research and public health*, 18(4), 1907. <https://doi.org/10.3390/ijerph18041907>.

³⁷³ Pawlowski, C. S., Nielsen, J. V., & Schmidt, T. (2021). A Ban on Smartphone Usage during Recess Increased Children's Physical Activity. *International journal of environmental research and public health*, 18(4), 1907. <https://doi.org/10.3390/ijerph18041907>

³⁷⁴ Twenge, J. M., & Campbell, W. K. (2019). Media Use Is Linked to Lower Psychological Well-Being: Evidence from Three Datasets. *The Psychiatric quarterly*, 90(2), 311–331. <https://doi.org/10.1007/s11126-019-09630-7> ; Twenge, J. M., Joiner, T. E., Rogers, M. L., & Martin, G. N. (2018). Increases in Depressive Symptoms, Suicide-

- i. Orben & Przybylski (2019) has been colloquially called the “potato study” because it found “the association of well-being with regularly eating potatoes was nearly as negative as the association with technology use...”³⁷⁵ Jean Twenge and colleagues have analyzed the same datasets used by Orben & Przybylski (2019) and found methodological flaws with the novel approach used in Orben & Przybylski (2019),³⁷⁶ and upon Twenge’s re-analysis of the data found much larger relationships with social media use and poor mental health.³⁷⁷
- h. A study by Primack and colleagues (2021) used a longitudinal prospective design to examine a cohort of individuals who were and were not initially depressed, to see whether and how social media use related to their depression status.
 - i. It showed a dose dependent impact of baseline social media use on the development of depression ($p < 0.001$).³⁷⁸ “Among 990 participants who were not depressed at baseline, 95 (9.6%) developed depression by follow-up.”³⁷⁹
 - ii. The authors write, “Compared with those in the lowest quartile, participants in the highest quartile of baseline social media use had significantly increased odds of developing depression (AOR=2.77, 95% CI=1.38, 5.56). However, there was no association between the presence of baseline depression and increasing social media use at follow-up (OR=1.04, 95% CI=0.78, 1.38).”³⁸⁰
 - iii. The authors conclude, “In a national sample of young adults, baseline social media use was independently associated with the development of

Related Outcomes, and Suicide Rates Among U.S. Adolescents After 2010 and Links to Increased New Media Screen Time. *Clinical Psychological Science*, 6(1), 3-17. <https://doi.org/10.1177/2167702617723376>

³⁷⁵ Orben, A., & Przybylski, A. K. (2019). The association between adolescent well-being and digital technology use. *Nature human behaviour*, 3(2), 173–182. <https://doi.org/10.1038/s41562-018-0506-1>

³⁷⁶ Twenge, J. M., Haidt, J., Joiner, T. E., & Campbell, W. K. (2020). Underestimating digital media harm. *Nature human behaviour*, 4(4), 346–348. <https://doi.org/10.1038/s41562-020-0839-4>

³⁷⁷ Twenge, J. M., Haidt, J., Lozano, J., & Cummins, K. M. (2022). Specification curve analysis shows that social media use is linked to poor mental health, especially among girls. *Acta psychologica*, 224, 103512. <https://doi.org/10.1016/j.actpsy.2022.103512>

³⁷⁸ Primack, B. A., Shensa, A., Sidani, J. E., Escobar-Viera, C. G., & Fine, M. J. (2021). Temporal Associations Between Social Media Use and Depression. *American journal of preventive medicine*, 60(2), 179–188. <https://doi.org/10.1016/j.amepre.2020.09.014>

³⁷⁹ Primack, B. A., Shensa, A., Sidani, J. E., Escobar-Viera, C. G., & Fine, M. J. (2021). Temporal Associations Between Social Media Use and Depression. *American journal of preventive medicine*, 60(2), 179–188. <https://doi.org/10.1016/j.amepre.2020.09.014>

³⁸⁰ Primack, B. A., Shensa, A., Sidani, J. E., Escobar-Viera, C. G., & Fine, M. J. (2021). Temporal Associations Between Social Media Use and Depression. *American journal of preventive medicine*, 60(2), 179–188. <https://doi.org/10.1016/j.amepre.2020.09.014>

depression by follow-up, but baseline depression was not associated with an increase in social media use at follow-up. This pattern suggests temporal associations between social media use and depression, an important criterion for causality.”³⁸¹

- i. As stated previously, I am familiar with the work of Eva Telzer, and I find consistency between my own patients’ conditions and Dr. Telzer’s findings that teens who find social media more salient are more likely to be heavy users of social media and are more likely to be depressed as a result of heavy social media use.³⁸²
- i. In a school-based sample of 687 adolescents (48.6% girls; Mage = 14.3; 38.1% White, 29.4% Hispanic, 23.0% Black), participants were assessed at two time points, one year apart, allow for assessment of a potential causal interaction between social media exposure at time point one, and depressive symptoms at time point two.³⁸³
- ii. Findings show that greater positive emotional responses to social media at time point one were associated with increased social media use frequency and increased depressive symptoms at time point two.³⁸⁴ The researchers noted, “Findings of the current study suggest that more frequent positive emotional responses to social media may precede and predict depressive symptoms....”³⁸⁵

³⁸¹ Primack, B. A., Shensa, A., Sidani, J. E., Escobar-Viera, C. G., & Fine, M. J. (2021). Temporal Associations Between Social Media Use and Depression. *American journal of preventive medicine*, 60(2), 179–188. <https://doi.org/10.1016/j.amepre.2020.09.014>

³⁸² Nesi, J., Rothenberg, W. A., Bettis, A. H., Massing-Schaffer, M., Fox, K. A., Telzer, E. H., Lindquist, K. A., & Prinstein, M. J. (2022). Emotional Responses to Social Media Experiences Among Adolescents: Longitudinal Associations with Depressive Symptoms. *Journal of clinical child and adolescent psychology : the official journal for the Society of Clinical Child and Adolescent Psychology*, American Psychological Association, Division 53, 51(6), 907–922. <https://doi.org/10.1080/15374416.2021.1955370>

³⁸³ Nesi, J., Rothenberg, W. A., Bettis, A. H., Massing-Schaffer, M., Fox, K. A., Telzer, E. H., Lindquist, K. A., & Prinstein, M. J. (2022). Emotional Responses to Social Media Experiences Among Adolescents: Longitudinal Associations with Depressive Symptoms. *Journal of clinical child and adolescent psychology : the official journal for the Society of Clinical Child and Adolescent Psychology*, American Psychological Association, Division 53, 51(6), 907–922. <https://doi.org/10.1080/15374416.2021.1955370>

³⁸⁴ Nesi, J., Rothenberg, W. A., Bettis, A. H., Massing-Schaffer, M., Fox, K. A., Telzer, E. H., Lindquist, K. A., & Prinstein, M. J. (2022). Emotional Responses to Social Media Experiences Among Adolescents: Longitudinal Associations with Depressive Symptoms. *Journal of clinical child and adolescent psychology : the official journal for the Society of Clinical Child and Adolescent Psychology*, American Psychological Association, Division 53, 51(6), 907–922. <https://doi.org/10.1080/15374416.2021.1955370>

³⁸⁵ Nesi, J., Rothenberg, W. A., Bettis, A. H., Massing-Schaffer, M., Fox, K. A., Telzer, E. H., Lindquist, K. A., & Prinstein, M. J. (2022). Emotional Responses to Social Media Experiences Among Adolescents: Longitudinal Associations with Depressive Symptoms. *Journal of clinical child and adolescent psychology : the official journal for the Society of Clinical Child and Adolescent Psychology*, American Psychological Association, Division 53, 51(6), 907–922. <https://doi.org/10.1080/15374416.2021.1955370>

- iii. In my opinion, this study's results are entirely consistent with the phenomenology of addiction, whereby the individual who finds any drug to be initially reinforcing (salient) is more likely to return to using that drug again and again, leading to neuroadaptation and tolerance, i.e. needing more of the drug over time to get the same effect. Tolerance drives increased use, leading ultimately to addictive use and the development of consequences related to use, such as depression.
- j. A 2022 meta-analysis by Liu et al. including 21 cross-sectional studies and five longitudinal studies with a total of 55,340 participants, found that the risk of depression increased by 13% (OR = 1.13, 95%CI: 1.09 to 1.17, $p < 0.001$) for each hour increase in social media use in teens.³⁸⁶
- k. A 2023 systematic review of 11 English-language studies examined the connection between social media use (Facebook, Instagram, Other Product, Snapchat, TikTok, Youtube) and depression symptoms in children and adolescents.³⁸⁷
 - i. The authors found that "Research demonstrated a modest but statistically significant association between social media use and depression symptoms" while noting that causality is unclear.³⁸⁸
 - ii. "Higher levels of social media usage were connected with worse mental health outcomes, and higher levels of social media use were associated with an increased risk of internalizing and externalizing difficulties among adolescents, especially females. The use of social media was also connected with body image problems and disordered eating, especially among young women, and social media may be a risk factor for alcohol consumption and associated consequences among adolescents and young adults."³⁸⁹

³⁸⁶ Liu, M., Kamper-DeMarco, K. E., Zhang, J., Xiao, J., Dong, D., & Xue, P. (2022). Time Spent on Social Media and Risk of Depression in Adolescents: A Dose-Response Meta-Analysis. *International journal of environmental research and public health*, 19(9), 5164. <https://doi.org/10.3390/ijerph19095164>

³⁸⁷ Khalaf A M, Alubied A A, Khalaf A M, et al. (August 05, 2023) The Impact of Social Media on the Mental Health of Adolescents and Young Adults: A Systematic Review. *Cureus* 15(8): e42990. doi:10.7759/cureus.42990

³⁸⁸ Khalaf A M, Alubied A A, Khalaf A M, et al. (August 05, 2023) The Impact of Social Media on the Mental Health of Adolescents and Young Adults: A Systematic Review. *Cureus* 15(8): e42990. doi:10.7759/cureus.42990, at p. 4.

³⁸⁹ Khalaf A M, Alubied A A, Khalaf A M, et al. (August 05, 2023) The Impact of Social Media on the Mental Health of Adolescents and Young Adults: A Systematic Review. *Cureus* 15(8): e42990. doi:10.7759/cureus.42990, at p. 4.

- l. Data from several cross-sectional, longitudinal, and empirical research studies, show that smartphone and social media use among teenagers relates to an increase in mental distress, self-harming behaviors, and suicidality.³⁹⁰
 - i. The authors also discussed benefits received through social media use, including social connectedness.³⁹¹
 - ii. As noted elsewhere in this Report, benefits of social media to some users do not negate the substantial harms on other users due to products designed to be addictive.
- m. In sum, a growing body of literature demonstrates that decreasing social media consumption can improve psychological and physical well-being, especially in youth with emotional distress.
- n. I find that the weight of the evidence is consistent with my clinical experience, that is, as social media use goes up, physical and mental health harms increase, and as social media use goes down, in particular in youth with emotional distress, physical and mental health improves.
- o. Youth with co-occurring mental health disorders and other forms of emotional distress are more vulnerable to social media addiction and related harms than youth without. Nonetheless, the social medium itself confers greater risk than users' individual characteristics. When distressed youth reduce or discontinue social media use, they show improvements in physical and emotional well-being.

Conclusion:

Addictive social media platforms exploit our innate need for human connection by increasing access, quantity, potency, novelty, and uncertainty of social rewards, leading to brain and behavioral changes consistent with social media addiction. Young people are especially vulnerable to these harms, in particular those struggling with poor mental health. While some users may benefit from social media, such benefit does not negate the harm caused to a substantial population of users. Defendants' own documents show that their products are addictive and that as a result, a subset of their youth users are harmed.

³⁹⁰ Khalaf A M, Alubied A A, Khalaf A M, et al. (August 05, 2023) The Impact of Social Media on the Mental Health of Adolescents and Young Adults: A Systematic Review. Cureus 15(8): e42990. doi:10.7759/cureus.42990, at p. 1.

³⁹¹ Khalaf A M, Alubied A A, Khalaf A M, et al. (August 05, 2023) The Impact of Social Media on the Mental Health of Adolescents and Young Adults: A Systematic Review. Cureus 15(8): e42990. doi:10.7759/cureus.42990, at pp.8-9.

Exhibits to this Report:

Attached as Exhibit A is a copy of my current curriculum vitae.

Attached as Exhibit B is a list of data or other information considered by me in forming the opinions expressed herein.

Attached as Exhibit C is a statement of my compensation for services performed in this case.

Attached as Exhibit D is a list of all cases in which I have testified as an expert at trial or by deposition during the past four years.

Executed on: April 18, 2025


Anna Lembke, M.D.