Digital Decay -Brain Rot: The Impact ff Prolonged Screen Time on Brain Health

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Abstract-The increasing reliance on digital devices has led to a phenomenon termed "brain rot," describing the cognitive and psychological decline associated with excessive screen exposure. Prolonged screen time disrupts sleep cycles, alters brain chemistry, desensitizes the brain's reward system, and contributes to stress, anxiety, and attention disorders. Emerging research highlights the negative impact of binge-watching, doomscrolling, and social media addiction on cognitive function and mental well-being. This paper explores the adverse effects of excessive digital consumption, emphasizing the importance of mitigating strategies such as mindfulness, outdoor activities, structured screen time, and fostering real-world interactions. By understanding the neurological and psychological consequences of screen overuse, individuals can adopt evidence-based approaches to maintain cognitive health in an increasingly digitalized world.

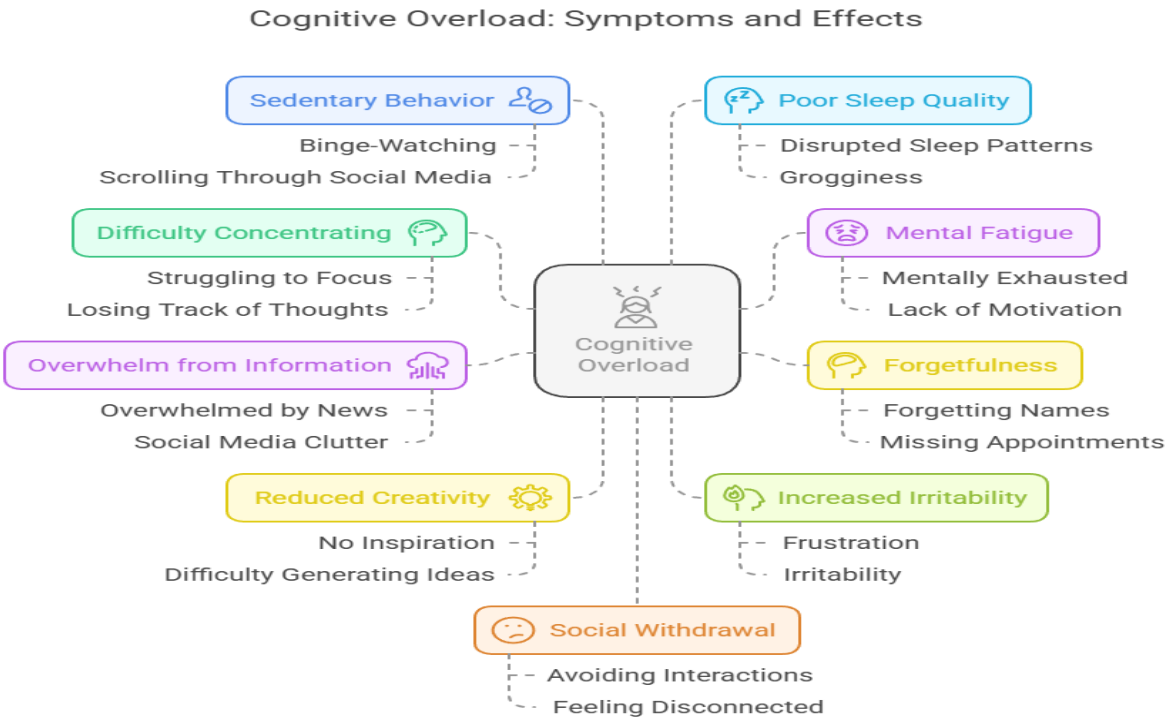
Keywords-Brain rot, screen time, cognitive decline, digital detox, social media addiction, attention span, dopamine desensitization, mental health, digital well-being, screen exposure effects

INTRODUCTION

'Brain rot' is defined as "the supposed deterioration of a person's mental or intellectual state, especially viewed as the result of overconsumption of material (now particularly online content) considered to be trivial or unchallenging. Also: something characterized as likely to lead to such deterioration".
According to Oxford University Press, 'Brain Rot' reflects the increasing concern over how technology is shaping human thought processes and habits. Its usage surged in recent years, particularly among younger demographics, to describe the mental fatigue caused by binge-watching videos, doomscrolling, or engaging with low-quality online content. In 2024, 'brain rot' is used to describe both the cause and effect of this, referring to low-quality, low-value content found on social media and the internet, as well as the subsequent negative impact that consuming this type of content is perceived to have on an individual or society.[1] Brain Rot' describes the cognitive decline attributed to excessive exposure to mindless social media content. The term gained momentum alongside the rise of trends like 'digital detoxes,' where individuals consciously take breaks from screens to counteract feelings of burnout or mental stagnation. Linguists have noted that its casual tone makes it accessible, especially to younger audiences, while its evocative imagery resonates deeply with broader societal fears of intellectual decline.[2]
The word Brain rot was coined in 1854 by Henry David Thoreau in his book Walden.[1]The word initially gained traction on social media among Gen Z and Gen Alpha communities, but it's now being used in the mainstream as a way to describe low-quality, low-value content found on social media.[1]Oxford University Press (OUP) has announced 'brain rot' as the Oxford Word of the Year for 2024.[2]
"It's not how long we're using screens that really matters; it's how we're using them and what's happening in our brains in response," says Rich, director of the Center on Media and Child Health at Boston Children's Hospital[3]Binge-watching television, watching YouTube videos for hours, or scrolling on your phone every morning may seem harmless, but research shows that too much screen time may be detrimental to your health.[5]
Too much screen time can impact our health in a myriad of ways, from eye strain and neck pain to social isolation and mental health, and in some cases, it may cause harm to our brains. Since the eyes are directly connected to the brain, Loeffler encourages us to think about our eye health to ensure overall brain health. Rather than looking at our phones upon waking, Loeffler recommends starting each morning looking at the horizon or an object outside and far away.[5]

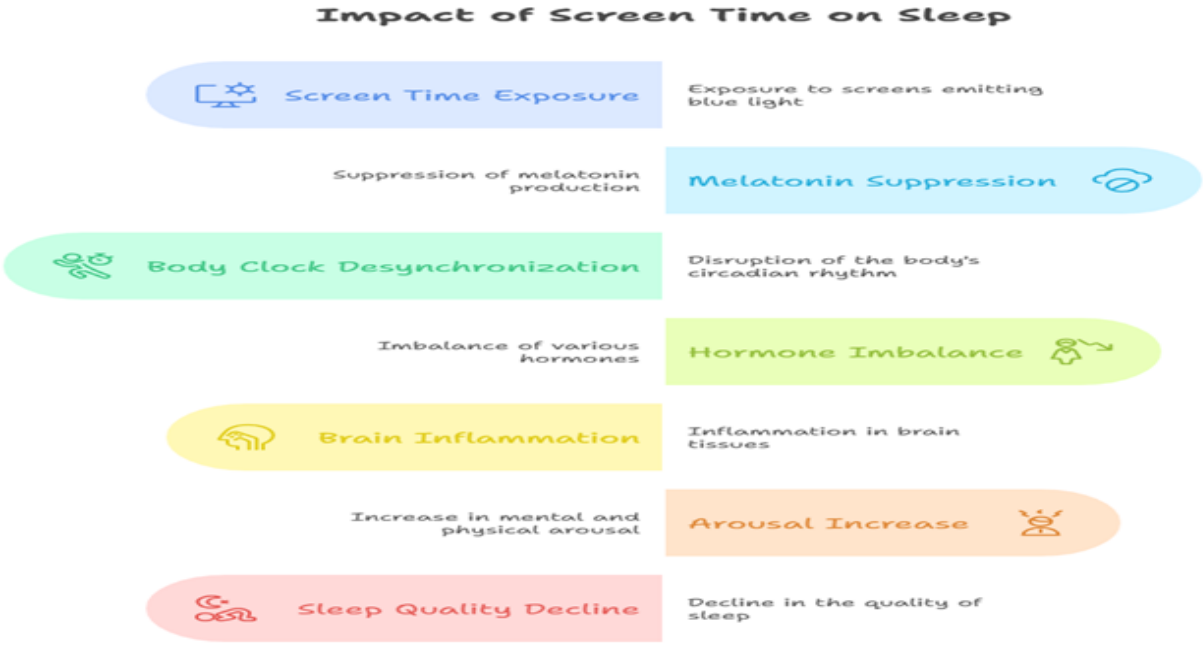
UNVEILING THE EFFECTS OF SCREEN TIME EXPOSURE

Excessive screen time is a growing concern in modern society, with the proliferation of digital devices contributing to increased sedentary behavior and potential hazards to physical health, mental health, and overall well-being. [4]

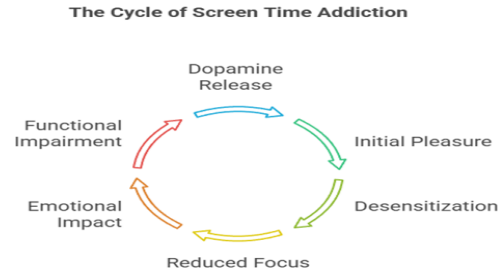


a) Screen time disrupts sleep and desynchronizes the body clock.

Because light from screen devices mimics daytime, it suppresses melatonin, a sleep signal released by darkness. Just minutes of screen stimulation can delay melatonin release by several hours and desynchronize the body clock. Once the body clock is disrupted, all sorts of other unhealthy reactions occur, such as hormone imbalance and brain inflammation. Plus, high arousal doesn't permit deep sleep, and deep sleep is how we heal.



b) Screen time desensitizes the brain's reward system. Many children are "hooked" on electronics, and in fact, gaming releases so much dopamine—the "feel-good" chemical—that on a brain scan it looks the same as cocaine use. But when reward pathways are overused, they become less sensitive, and more and more stimulation is needed to experience pleasure. Meanwhile, dopamine is also critical for focus and motivation, so needless to say, even small changes in dopamine sensitivity can wreak havoc on how well a child feels and functions.



c)Screen time produces "light-at-night."

Light-at-night from electronics has been linked to depression and even suicide risk in numerous studies. In fact, animal studies show that exposure to screen-based light before or during sleep causes depression, even when the animal isn't looking at the screen. Sometimes parents are reluctant to restrict electronics use in a child's bedroom because they worry the child will enter a state of despair—but in fact, removing light-at-night is protective.

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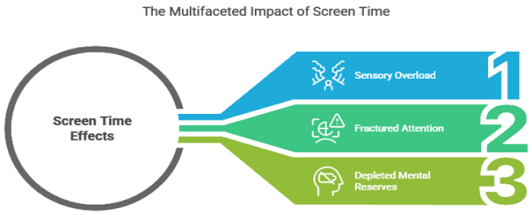
d)Screen time induces stress reactions.

Both acute stress (fight-or-flight) and chronic stress produce changes in brain chemistry and hormones that can increase irritability. Indeed, cortisol, the chronic stress hormone, seems to be both a cause and an effect of depression—creating a vicious cycle. Additionally, both hyperarousal and addiction pathways suppress the brain's frontal lobe, the area where mood regulation actually takes place.



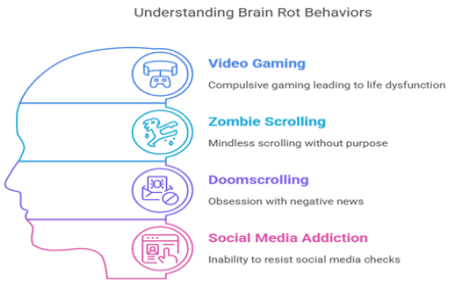
e)Screen time overloads the sensory system, fractures attention, and depletes mental reserves.

Experts say that what's often behind explosive and aggressive behavior is poor focus. When attention suffers, so does the ability to process one's internal and external environment, so little demands become big ones.

By depleting mental energy with high visual and cognitive input, screen time contributes to low reserves. One way to temporarily "boost" depleted reserves is to become angry, so meltdowns actually become a coping mechanism.

BRAIN ROT BEHAVIOR COMES IN VARIOUS FORMS, INCLUDING:

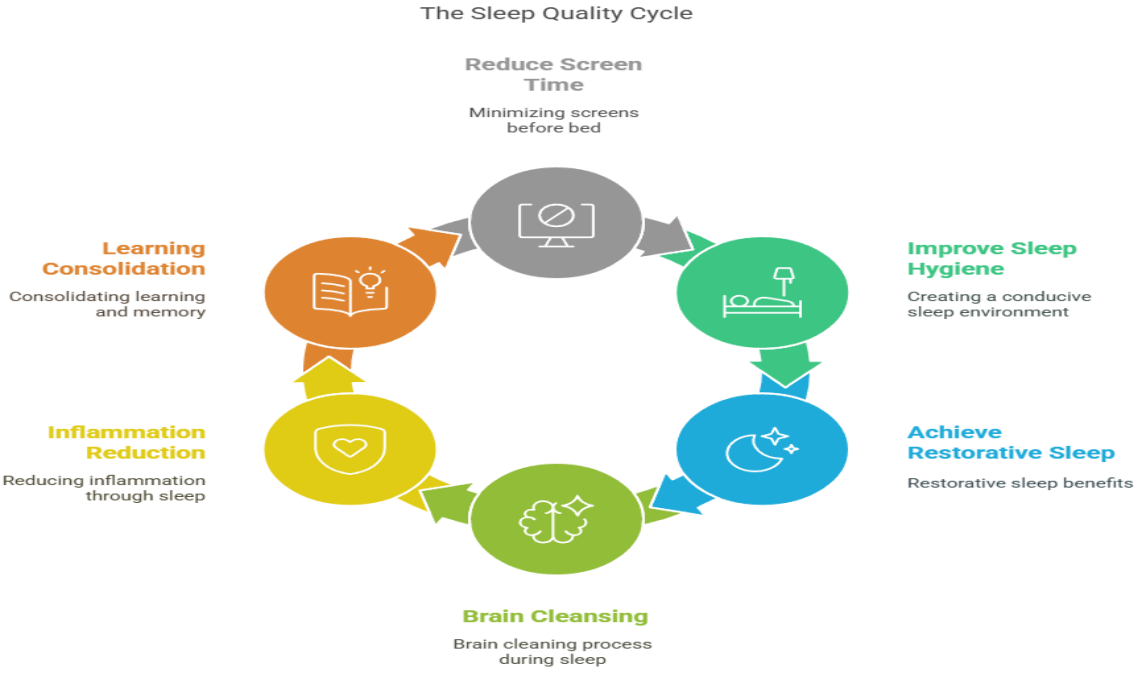
- Video gaming: While it's possible to game without getting addicted, some gamers play compulsively and develop gaming disorder. They become so entranced by video games' alternate worlds, fanciful characters, and complicated plots that they can have difficulty functioning in other areas of life.[6]
- Zombie scrolling: This bran rot behavior refers to mindless habitual scrolling with no destination in mind or benefit derived. When zombie scrolling, you vacantly stare at your smart phone as you flit from one feed to another.[6]



- Doomscrolling: Doomscrolling involves searching for distressing information and negative news. Doomscrollers feel an overwhelming desire to be up to date on the latest information, even when it's disturbing.[6]
- Social media addiction: Social media addiction is characterized by a persistent urge to check social media and a feeling of restlessness when you try to break the habit. Users can't stop checking platforms like YouTube, Instagram, and TikTok. Constant notifications, bright colors, and stimulating sounds can literally mesmerize them, causing them to stop thinking clearly.[6]

10 EVIDENCE-BASED STRATEGIES CAN PREVENT BRAIN ROTIING FROM SCREEN TIME

1. Increase exposure to greenery, nature, and sunlight. A growing body of research suggests that green spaces enhance mental health and learning capacity both immediately and over time, by lowering stress levels and restoring attention. Greenery restores attention by drawing the eye while calming the nervous system simultaneously, creating a state of "calm alertness" –a state considered ideal for learning. (This is in contrast to stress-based alertness associated with screen activities, which deplete attention.)[7]
   Similarly, studies show exposure to sunlight can reduce attention deficit symptoms, while abundant bright light first thing in the morning can help restore disrupted circadian rhythms, improve mood, and enhance restorative sleep.
2. Incorporate more movement, exercise and free play. While stress and screen-time break down brain connectivity, exercise does the reverse—it builds connections and actually makes the brain bigger. Exercise fights depression, poor focus, insomnia, addiction, and anxiety by raising and balancing the very brain chemicals and hormones that become imbalanced from using electronics. In addition, varied and regular movement throughout the day helps develop core muscle strength, stimulates the vestibular system, and discharges pent-up energy—all things that foster learning and mood regulation. And free play is not just for fun—it encourages brain integration, mastering of new skills, grasping others' mental states, cause-and-effect thinking, and managing conflict.[8]
3. Practice sleep hygiene and create a "sleep sanctuary." Numerous studies have shown that higher amounts of daily screen-time and screen-time in the evenings disrupt sleep. Changes include suppressed REM, less time spent in the deeper stages of sleep, and a blunted drop in core body temperature. Conversely, restorative sleep is reparative—it helps the brain "clean house", reduces inflammation, and consolidates learning.

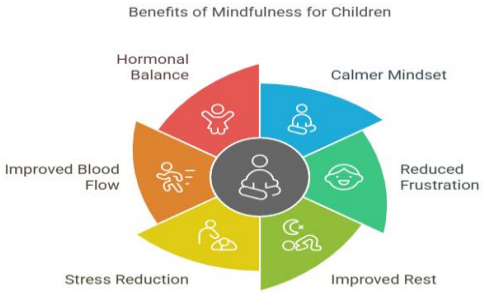


You can facilitate more restorative sleep and boost melatonin (the "sleep hormone") by establishing a consistent sleep-wake routine (including on the weekends), keeping *all* screens out of the bedroom, using a sleep mask and blackout curtains to make the sleep environment as close to pitch-black as possible, avoiding heavy meals close to bedtime, and keeping the temperature of the room cool. Research suggests that parent-set bedtimes are associated with better sleep and improved functioning. To visually send the brain the message that it's time to sleep, the bedroom should be uncluttered, void of reminders of tasks to be done, and cozy-feeling.[9]

4. Engage in creative play and activities. Creative activities stimulate the right brain, the hemisphere that is often underactive in our information-overloaded world. But the creative process also activates areas throughout the entire brain, facilitating whole-brain and brain-body integration. Moreover, flexing our creative muscle helps build problem-solving skills.

   Meanwhile, studies show screen-time stunts imaginary play. When the brain is fed a constant stream of stimulating entertainment that saturates the senses, it deadens the creative drive, as does viewing a 2-D screen with flat, unnatural light. In contrast, reduced levels of stimulation enhance creativity, and varying depth of field and the interplay of depth and shadow found in the natural world stimulate the mind to wonder and imagine.[10]

5. Practice mindfulness. Mindfulness includes activities like yoga, meditation, or breathe work. While it can be tricky to get children to meditate, most will enjoy kids' yoga once they get started, and the benefits of such practices cannot be overstated. When children start practicing a mindfulness activity, invariably they are calmer, less easily frustrated, and better rested. How? Meditation and yoga quiet the brain, reduce stress and stimulation, improve blood flow, and even balance our hormones. As mentioned, electronic stimulation combined with our hectic lifestyles mean that most of us get too much stimulation.[11]



Research suggests that meditation is associated with increased thickness of the cortex—the exact opposite of an effect found in tech addiction. Another study showed that second and third-graders who were taught mindfulness techniques showed an improvement in executive functioning, particularly in those with pre-existing attention problems.

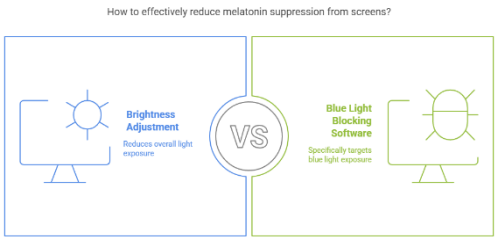
6. Bring on the bonding: human touch, empathy, and love. It is well-documented that children who are held, rocked, soothed and attended to by an "in tune" parent have larger brains than children who are touched less or who are outright neglected. Eye contact, in particular, fosters bonding and stimulates brain development, and children these days receive less eye contact than ever because of both kids and parents being locked onto screens. Eye contact, face to face interaction, touch, and observing body language all help children learn to regulate emotion and arousal, develop a sense of self, and build capacity for intimacy. Further, healthy attachment to caregivers actually protects against addictions of all kinds, including tech addiction.

   Other research has shown that expressing and feeling love and compassion helps stimulate the frontal lobe and facilitates executive functioning and self-regulation.[12]

7. Incorporate daily chores for the entire family—even the little ones. The Learning Habit Study showed that kids with the highest GPA's did more chores, had less than 30 minutes of daily screen-time, and spent more time with their parents. Another study showed that children who started doing chores at age 3 or 4 were more likely to have successful relationships and careers and were more self-sufficient. For adults, daily chores have been shown to boost mood and productivity and to decrease risk of heart

disease—a condition closely tied to chronic stress.

8. Mimic nature's day/night light cycles as closely as possible. Artificial light-at-night, from lighting our homes but especially from screens, throws off the body clock as well as hormone and brain chemistry regulation, contributing to depression, impaired daytime functioning, obesity, and other health issues. To best counteract this, avoid screen activities (especially interactive ones) after sundown. And, as mentioned earlier, increase exposure to natural sunlight during the day.
   Also, energy-efficient bulbs (both CFLs and LEDs) emit poor light quality and have been shown to raise stress levels and negatively impact mood. Switch to incandescent bulbs (halogens are closest to the old-style incandescents) to create a more soothing and natural environment.[13]
9. Tone down the brightness levels on *all* screens. For televisions, choose the "natural" setting and lower the brightness and contrast controls to more closely match the surrounding environment. For computers, laptops, tablets, and phones, download software such as f.lux on all your devices, to warm and darken the screen as it gets later in the day.[14] This will help block some of the melatonin-suppressing blue light—but know that melatonin can still be suppressed from screens *even when blue light is blocked*—just not as much.[15]



10. Go wired and give WiFi the boot. This will kill two birds with one stone. First, research suggests that electromagnetic fields emitted by WiFi signals may suppress melatonin and increase arousal levels, just as screen light does. Second, using wired-only Internet access automatically reduces device use, while increasing productivity when you do use it. If you can't commit to that, at least turn off the WiFi at night to give the nervous system a break.[16]

CONCLUSION

The concept of "brain rot" has evolved from a casual slang term to a widely recognized phenomenon, reflecting growing concerns about the impact of excessive screen time and low-quality digital content on cognitive health. While technology offers numerous benefits, its overuse—especially through activities like binge-watching, doomscrolling, and social media addiction—can lead to mental fatigue, reduced attention span, and negative psychological effects. Studies suggest that excessive screen exposure disrupts sleep patterns, alters brain chemistry, and contributes to stress and addiction-like behaviors.

However, awareness and proactive strategies can mitigate these effects. Incorporating mindfulness, outdoor activities, structured screen time, and fostering real-world connections can help maintain cognitive well-being. As discussions around digital consumption continue, it becomes increasingly vital to strike a balance between technology use and mental health, ensuring that our digital habits enhance rather than hinder our intellectual and emotional well-being.

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