

Wireless Mobile Device Overuse and Obesity: Understanding the Neuroscience, Implications and Interventions

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Background: While wireless mobile device (WMD) overuse might be perceived as normal behavior in people of all ages, the pathophysiology of WMD addiction is similar to that of substance addiction. Increasing prevalence of disorders related to screentime/sedentary lifestyle such as obesity, dyslipidemia, prediabetes, and type 2 diabetes mellitus calls for comprehensive and cost-effective interventions.

Objectives: We aimed to synthesize existing data on the neuroscience that underlies WMD addiction, its adverse health outcomes and suggest practical strategies to achieve life-technology balance at home and work.

Methods: Comprehensive search of databases (PubMed and MEDLINE) was conducted until May 2021, for smartphone, screentime and phone addiction. The data were collected as part of a population-based educational initiative, Phreedom (Freedom from smartPhone), to inspire individuals to achieve life-technology balance.

Results: From the initial 655 citations, 234 were included. The addictive use of WMDs was linked to the 'incentive sensitization theory of addiction': repeated exposure to potentially addictive stimuli (i.e., notifications) can cause persistent structural and functional brain changes in the prefrontal cortex. As a result, an individual's executive functions and cue-reactivity could be impaired. The hyper-reactive dopamine system could also drive this compulsive behavior in the form of a habit-loop of cue, craving, response, and reward. Each hour/day increase in screentime was associated with 0.05-0.07 increase in body mass index (BMI) ($p < 0.001$), likely due to food marketing, distracted eating, reduced satiety, and procrastination of physical activity. Overuse of WMDs was associated with insufficient and low-quality sleep, daytime tiredness, daytime sleepiness, depression, and daily cognitive failures. Nine of 10 Americans reported using a technological device in the hour before bed. The more interactive the device, the higher the difficulty falling asleep and unrefreshing sleep ($p < 0.05$). The younger the age at initial exposure and the longer the duration of exposure, the higher the odds of adverse health outcomes, such as illegal substance use. High users of screens were more likely to have been diagnosed with anxiety or depression, requiring medication. Practical strategies to disrupt the addictive dopamine habit-loop included WMD triage and uncluttering, eliminating redundant notifications, deleting time-consuming applications, modifying the digital environment at home and work, and replacing screentime with greentime. Other tactics could include using an alarm clock, wearing a wristwatch, specifying times to check emails and social media, refocusing teams to decrease reliance on text messages and lowering expectations of immediate responses.

Conclusions: While it would be irrational to suggest complete avoidance of all WMDs, moderation, balance, and real-life engagement together with strategies aimed at disrupting the dopamine habit loop will be critical components of any intervention plan. Educating patients about the neuroscience of WMD addiction and empowering them with tips to curb WMD use might impact their behavior substantially.

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