

**Inherited Vulnerability:  
The Biopsychosocial Model of Technology-Related Addictive Behaviors in the Children of Addicted  
Parents**

Hailey Cantwell

Department of Psychology, Southern New Hampshire University

PSY 444

Dr Vincent Corbo

April 17, 2025

### **Abstract**

This literature review explores how the intergenerational patterns of addiction contribute to the development of technology-related addictive behaviors (TRABs) in children, through the use of the biopsychosocial model as the organizational foundation. TRABs, such as internet addiction (IA) and internet gaming disorder (IGD) share key features with substance use disorder (SUDs). Including the reward system dysregulation, impaired impulse control, and behavioral impairments. By examining the biological risk factors, including genetic predisposition, dopaminergic pathway dysfunctions, and emerging epigenetic findings we can suggest that parental substance use may influence a child's vulnerability to compulsive behaviors. Psychological traits such as emotional dysregulation, impulsivity, psychiatric comorbidities, and insecure attachment continue to raise the susceptibility to TRABs. Especially in children who are raised in homes affected by addiction. Additionally, social influences involving dysfunctional familial modeling, peer normalization of excessive technology use, and chronic socioeconomic stressors can compound within at-risk children. When put together, the interactions occurring amongst the biological, psychological, and social factors may contribute to a raised likelihood of obtaining a TRAB. The following findings highlight the need for early screening, targeted interventions, and longitudinal research to better understand the development of TRABs within high-risk populations.

### **Literature Review**

#### **Introduction**

Access to the internet and technology has become increasingly more accessible worldwide. A 2024 report from the International Telecommunication Union (ITU) showed that in

2014 approximately 2.6 billion (35%) out of ~7.3 billion people were internet users; 2024 saw an increase to 5.3 billion users (65%) out of ~8.1 billion people. The number of users has doubled within that ten-year span. Within this, there is a rising concern regarding the manifestation of technology-related addictive behaviors (TRABs). However, due to the lack of formal diagnosis, researchers utilize varying terms, leading to inconsistencies in how TRABs are studied and understood.

This research will focus on the three most prevalently considered TRABs: problematic internet usage (PIU), was initially introduced by Beard and Wolf (2001), described as patterns of internet behaviors that lead to psychological or social difficulties. Internet addiction (IA), the most widely used, defined as the excess or lack of control toward the use of internet and technology that leads to distress and impedes on daily functioning (Shaw & Black, 2008). Followed by internet gaming disorder (IGD), defined by the persistent use of internet games, which leads to distress, withdrawal, and loss of control (American Psychiatric Association, 2013). This is due to the immersive properties and rewards, which addresses many functional needs such as: forming relationships, feelings of accomplishment, or escapism. Due to these motivations, there is increased levels of desire and pleasure when playing games more frequently, which in effect sensitizes the brain's reward system and may lead to addictive symptoms (Wei, et. Al., 2017).

Behavioral addictions, including TRABs, have been increasingly recognized as resembling substance use disorders (SUDs) regarding their impacts on neurobiology, psychological functioning, and social consequences. SUDs are characterized by the compulsive engagement with a substance, regardless of the consequences; it presents symptoms such as: withdrawal, tolerance, and impaired control. Include ten classes of drugs most notably alcohol,

opioids, and tobacco. It is common amongst each class to have intense levels of activations within the reward system (American Psychiatric Association, 2013). The biopsychosocial model offers a comprehensive framework to better understand these behaviors. As it integrates the importance of biological predispositions, psychological traits, and social influences. We look to further explore the significance of intergenerational addiction and the potential risk factors involved in the development of TRABs in at-risk children. To better understand the theoretical and clinical significance of these behaviors it is vital to explore TRABs, particularly in relation to SUDs.

### **Technology-Related Addictive Behaviors (TRABs) & DSM-5 Context**

Whilst the DSM-5 mentions non-substance-related disorders (NSRD)—commonly referred to as behavioral addictions—only gambling disorder is currently classified. NSRDs are identified as disorders that activate the reward systems in a similar manner to substances, without the involvement of ingesting a psychoactive substance (American Psychiatric Association, 2013; Shaw & Black, 2008). IGD is actively listed in Section III of the DSM-5 as a condition requiring more peer review, yet no other TRABs have been formally recognized. A main reason being the lack of clarity in definition. Ağirhan, et. Al. (2024), have provided a recent definition of a behavioral addiction to technology as involving excessive, uncontrollable usage, often driven by the constant desire to be engaged, whilst feeling relaxed during use, and irritable when restricted. There is an overall lack of a consistent clinical framework, which severely limits diagnostic reliability and development of treatment plans. Researchers emphasize the importance of having diagnostic reliability, as it is essential for valid identification of mental disorders. When this is lacking, researchers' findings may be flawed or non-replicable, and clinical understandings

regarding symptom progression or treatment response may be severely compromised (Chmielewski, et. Al., 2015).

Terminological inconsistencies continue to further complicate tackling the ever-growing issue of TRABs. Researchers have employed a variety of overlapping labels including, but not limited to: IA, IGD, digital addiction (DA), PIU, social media addiction (SMA), and smartphone addiction (SA). The term Problematic Internet Use (PIU) was introduced initially in 2001 by Beard and Wolf to describe patterns of internet behaviors that lead to psychological or social difficulties. PIU is typically considered to be a less severe issue on the behavioral continuum when compared to internet addiction. There are two theoretical models which guide PIU research: the Cognitive Behavioral Model and the Social Cognitive Theory model, which has assisted in the formation of psychometric tools like the GPIUS and GPIUS2 to assess PIU (Fernandes, et al., 2019). Literature and research continue to be divided regarding whether PIU is a primary disorder or comorbid conditions such as SUDs, depression, or anxiety.

Despite classification challenges, recent evidence has demonstrated that TRABs share significant features with SUDs. A meta-analysis by Zeng et al. (2024) uncovered both behavioral and substance addictions disrupt large-scale functional networks (LSFNs), including the frontoparietal, default mode, salience, and affective networks. These network alterations are associated with behavioral impairments in reward seeking, inhibition, and attentional control. Whilst SUDs exhibit much greater hypoconnectivity in regions like the inferior frontal gyrus—suggestive of long-term neurotoxicity---the shared neural profiles between TRABs and SUDs indicate overlapping mechanisms warranting deeper investigation. Specifically, regarding the brain structure and function to better understand potential risk factors to developing TRABs, especially in children of parents with SUDs.

## **Biological Factors**

### ***Genetic Predisposition to Addiction and Risk Factors***

Genetic predispositions assist in the intergenerational transmission of addiction. Waaktaar, et al. (2018) suggested that genetics and environmental factors have varying roles within SUDs and the consistency or stability of substance use over time. Sahanapriya, et al. (2021) found that having a parent with an addiction disorder is significantly correlated with moderate levels of internet addiction (IA) in adolescent children. This suggests a need to better understand underlying risk factors so that well-informed preventative measures and treatments may be established.

Within recent years, there has been an influx in research delving into the potential genetic risk factors that may be present regarding TRABs. Studies have highlighted how genetic polymorphisms GABRA6 and SLC6A2 influence impulsivity and behavioral control and are risk traits for both SUDs and TRABs (Trucco, et al., 2016; Silveri et al., 2013). Lower GABA and creatine levels in the anterior cortex (ACC) are also linked to impaired impulse control, potentially increasing the susceptibility of TRABs. Hatoum et al. (2022) proposed the concept of an addiction-risk-factor, that suggests a shared genetic liability across SUDs including: tobacco, alcohol, cannabis, and opioid use disorders. Continuing to support the idea of a unidimensional genetic basis for addictive behaviors across both substances and behaviors.

### ***Neurobiological Mechanisms***

Neurobiological evidence suggests parallels between substance addiction and compulsive technology use, particularly within the dopamine reward system. TRABs and SUDs appear to impact dopaminergic pathways and reward circuitry in similar ways.

One of the most critical neural circuits mentioned in both SUDs and TRABs is the dopaminergic reward system. This system regulates motivation, reinforcement learning, and the experience of pleasure. In both substance-related and behavioral addictions, dopamine dysregulation has been linked to compulsive pursuit of rewarding stimuli, even despite negative consequences (Wei et al., 2017). The repeated exposure of highly stimulating online environments that one may experience with IGD specifically, leads to increased dopaminergic activity. Inevitably reinforcing the behavior through a cycle of anticipation and reward. Wei et al. (2017) proposed the idea of the Tripartite Model of Internet Gaming Disorder, which identifies three interacting systems that contribute to addiction: impulse system, altered interoceptive processing, and impaired self-regulation. Dysfunction across these systems mimics the neurocognitive patterns observed in SUDs. Specifically, within hyperactive reward circuits and underactive self-regulation.

Montag and Reuter (2017) unveiled that individuals with higher reward-dependence traits exhibited stronger compulsive tendencies when exposed to online environments. Individuals with IA were discovered to have increased levels of CC genotype rs1044396, which is associated with the activation of brain regions involved in dopaminergic reward processing.

Functional brain imaging has supported these similarities, in which Arató et al. (2023) discovered a positive association between compulsive internet usage and functional connectivity

within the amygdala. Qeadan et al. (2022) similarly found that problematic internet usage amongst college students was linked to higher risks to misuse substances and SUD diagnoses. Further, event-related-potential (ERP) is also associated with attention and cognitive processing (Hurby & Marksalek, 2003).

Other studies have shown overlapping structural brain changes in individuals with IA, including reduced gray matter density within the anterior and posterior cingulate cortex, insula, and lingual gyrus (Zhou et., 2011; Lin et al., 2012). Similar abnormalities have been discovered in people with SUDs. Another study observing abnormalities within the cerebellum and inferior parietal lobule in individuals with IGD and SUDs. These findings have shone a light on the shared deficits in impulse control and salience attribution (Moulton et al., 2014; Dong et al., 2012).

### ***Epigenetics***

In addition to the inherited genetic risk, recent research has emphasized the role of epigenetic mechanisms in the intergenerational transmission of addiction. Recent research has highlighted the role of epigenetic devices in the intergenerational transmission of addictive risk factors. According to the APA (2023), epigenetics is the study of how environment—stress, trauma, or substance use—can alter the activity of genes without altering the DNA itself, rather it alters the genetic code through DNA methylation or chromatin remodeling. In which genes can be activated or deactivated, which further affects the brain's functionality and development. This can assist in further explaining environment and biology interactions.

Parental exposure to addictive substances such as morphine, cocaine, alcohol, and heroin can induce epigenetic changes that are transmitted to their offspring, as soon as fertilization and



shortly after. These alterations can impact the child's stress regulation. As Riyahi et al. (2024) noted, epigenetic changes form a bridge between environment and genetics, which may assist in explaining why children of parents with SUDs may be more predisposed to exhibit similar behaviors when encountering stimuli the parent previously experienced.

Continuing emerging evidence suggests that these epigenetic effects are not only transmissible, yet also lead to behavioral outcomes that mirror those seen in parental addiction. For example, children of addicted parents potentially will exhibit a heightened sensitivity to rewards, diminished inhibitory control, and increased engagement in maladaptive behaviors like that of TRABs. This can begin to offer a framework to better understand how environmental and biological factors interact over generations to shape behavioral health outcomes.

## **Psychological Factors**

### ***Emotional Regulation & Impulsivity***

The psychological dimension of addiction risk highlights how emotional regulation, impulsivity, and underlying mental health concerns may contribute to the development of technology-related addictive behaviors (TRCBs). Particularly within children of parents with SUDs. Research has suggested that individuals with impaired emotional regulation are more likely to engage in compulsive behaviors as a coping mechanism (Kravchenko, 2023). This will especially stand true for children raised within unstable or neglectful environments, in which exposure to parental addiction may even disrupt the development of self-control and adaptive coping skills.

Technology use may become a maladaptive coping mechanism within these contexts—serving as an escape from household stress, trauma, or inconsistent parental emotional support. Children who are lacking emotional scaffolding or struggle with self-regulation may turn to online environments to fulfill unmet psychological needs. This reinforces the use of technology as emotional self-medication, seen frequently in both behavioral and substance-related addictions (Kravchenko, 2023).

A key underlying psychological trait for both SUDs and TRABs. Trucco et al. (2016) noted adolescents exhibiting high impulsivity are at a much greater risk for engaging in externalizing behaviors, including problematic internet use. These traits are often observed within children of parents with addiction histories, suggesting a psychological relationship in behavioral dysregulation across generations.

### ***Mental Health Comorbidities***

Comorbid mental health conditions such as ADHD, anxiety, and depression are commonly associated with both SUDs and behavioral addictions. Montag and Reuter (2017) classified internet addicted individuals into two subtypes: dual-diagnosed (DD) and ‘new’ internet addicts (NIA). In which DD individuals have a comorbid psychiatric condition, whilst NIAs do not have a pre-existing diagnosis. This classification supports the notion that TRABs can emerge as either a primary disorder or a maladaptive coping mechanism for underlying psychological distress. Children of parents with SUDs are even more vulnerable to becoming a dual-diagnosed user, due to the elevated likelihood of comorbid internalizing and externalizing disorders that present more commonly in this population. ADHD has been strongly associated

with internet and gaming addiction due to shared traits such as impulsivity, inattention, and a preference for immediate rewards (Brynte et al., 2022). Without early diagnosis or interventions, these conditions may go undetected, especially with at-risk children.

### ***Attachment Theory***

Attachment theory provides valuable insight into the development of addictive and compulsive behaviors. Children of parents with SUDs often experience inconsistent caregiving paired with emotional unavailability, which may impair the child's formation of secure attachments. As a result, the child may turn to an online environment to engage in chat rooms or games as a means of connection and emotional regulation, which further reinforces the above behaviors.

Recent studies have suggested that adolescents with insecure attachment styles may turn to technology as a means of emotional regulation. Hodge and Gebler-Wolfe (2022) found that such individuals often develop attachment-like relationships with their mobile devices to fulfill unmet emotional and psychological needs. Similarly, Trub and Barbot (2016) introduced this concept of 'digital attachment', where individuals with high attachment anxiety rely heavily on their smartphones, treating them as a substitute attachment figure. These patterns are especially prevalent surrounding children of parents with SUDs, who are more likely to have experienced inconsistent caregiving and seek out alternate means through technology.

When looked at together, these factors demonstrate the internal emotional world of a child is shaped by their inherited tendencies, as well as lived experiences. Altogether, this plays a critical role in the development of TRCBs, especially when paired with biological vulnerabilities,

psychological dysregulation may accelerate the pathway to addictive technology use in at-risk youth.

## **Social Factors**

### ***Familial Modeling & Household Instability***

Children raised in households with substance-using parents often experience environments that lack cohesion, consistent rules, and emotional support. These conditions can lead to maladaptive behavioral modeling, in which children internalize dysfunctional coping mechanisms—including technology-related addictive behaviors (TRABs). According to Jang et al. (2012), aggression was a significant indirect mechanism linking parental SUD to TRABs, specifically to internet addiction among adolescents. This suggests that family dysfunction may not only manifest emotional instability but also in behavioral patterns which promote excessive or compulsive technology use. Poor parental monitoring and emotional neglect may also reduce the protective factors which may otherwise prevent the onset of TRCBs. Children in said environments are frequently left to self-soothe or entertain themselves, making digital devices a convenient and reinforcing outlet. Over time, this can result in excessive screen reliance that mimics compulsive usage.

### ***Peer Influence***

As children age, peer groups begin to become a powerful socializing force. Which for at-risk children—especially from unstable homes—peer networks may serve as a refuge and risk factor. Adolescents may begin to imitate their peers' behaviors, especially relating to excessive internet or gaming use. As those behaviors are normalized and even rewarded within social circles (Montag and Reuter, 2017). On the contrary, insecure or more social withdrawn adolescents may

gravitate to online communities to substitute for in-person interactions. This reliance has the potential to further entrench TRCBs, particularly when platforms become the primary source of social validation.

### ***Socioeconomic Stress***

Children who are raised in a low socioeconomic household often face more chronic stressors, such as housing instability, community violence, or food insecurity. These environmental stressors contribute to psychological strain, which in effect increases reliance on screens as a coping mechanism. Socioeconomic hardship is linked to both behavioral risk-taking and limited access to mental health resources (Sutherland, 2012; Kravchenko, 2023). Additionally, parents in lower SES brackets may be more likely to rely on screen for childcare, whilst juggling multiple jobs, SUDs, or other stressors. This increased exposure, coupled with lower parental supervision, create an environment where TRCBs can thrive.

Collectively, these social factors illustrate how household dynamics, peer networks, and socioeconomic condition--focused on lower income—interact to shape the child's vulnerability to TRCBs. In children of parents with SUDs, these influences may interact with psychological and biological predispositions to heighten the risk of compulsive technology use. The child's internal emotional world, shaped by inherited tendencies and lived experience, plays a critical role in the emergence of TRCBs. When combined with social instability and biological vulnerabilities, psychological dysregulation may significantly accelerate the pathway to compulsive technology use in at-risk youth.

## Conclusion

Through the exploration of the intersection of intergenerational addiction its role in the development of technology-related addictive behaviors (TRABs) in children, this review applied the biopsychosocial model to effectively organize and interpret thoughts and findings. Research has demonstrated clear genetic and neurobiological continuities between SUDs and TRABs. Both groups exhibited altered dopaminergic functioning and structural brain changes within key regions such as anterior cingulate cortex, insula, and amygdala. Epigenetic research has continued to further support the concept of parental substance use can biologically alter the child's behavioral dysregulation.

Psychological mechanisms, such as emotional dysregulation, impulsivity, insecure attachment, and psychiatric comorbidities served as vital mediators of TRABs specifically within at-risk populations. Many traits have been found to be a result of early disruptions in caregiving, neglect, or trauma—frequently visible in homes affected by addiction. Similarly, social factors such as poor parental modeling, unsupervised peer environments, and socioeconomic stressed all contribute to additional risks by amplifying maladaptive coping.

When combined, these biological, psychological, and social factors interact to create a heightened vulnerability to TRABs in children of parents with SUDs. Understanding the relationship amongst these influences may provide a foundation that allows for early identification and interventions to begin to disrupt the intergenerational cycle of addictions. Future research should be conducted and prioritize longitudinal studies, specifically focused on tracking at-risk children from families with SUD histories to better understand the progression from early exposure to later TRABs. Most studies focused on adolescents and young adults, there is a further need for child-centered research to target the early childhood experiences and

how early screen exposure may interact with familial addiction. There is a great need for preventative interventions that combine emotional regulation training, family therapy, and digital literacy, especially for at-risk children.

### **Research Question**

Based on my current research, I am finding that I am increasingly more interested in developmental psychology research: specifically surrounding technology consumption and developmental disabilities. I'm initially planning on taking a gap year whilst beginning to apply to graduate programs, specifically a research-based program. In that time though, I am planning on applying to research assistant positions in the general area and continuing I have personally discovered a deep passion I am interested in exploring the question: to what extent does early exposure to parental substance abuse increase the vulnerability of technology-related addictive behaviors in at-risk youth? Furthermore, what are the most effective treatments to establish for these youth?

### **Reflection**

Within my time in two opposite liberal arts institutions, I feel that my initial opinions regarding LA have changed drastically. When I was a freshman At Arcadia, enrolled in a senior level business math course and I truthfully was reconsidering my decision to even attend college. I could not grasp the concept of why, I the only freshman in the course, would even be required to take such a thing. Yet, now looking back, I would scold myself for not talking with the professor, as he was the head of the program. The passion he held, matched his incredibly high expectations. Though, I changed my major halfway through that course, it really assisted me in

homing in my interest. As I was completely able to explore a topic, I thought I was interested in yet was able to take a sharp turn and continue down another path.

Another course I had the opportunity of taking at Arcadia, which was once I began my transition into early education and special education, was STEM learners. A course that was taught by three faculty, in which we created STEM based lesson plans and then went to local schools to teach the kids. This was around the same time when I began doing observations of the students, in which we would choose a student then write a report based on what we observed from their attempts to complete the activities. I truly began to really enjoy the idea of observations, yet thought my only option at that time was to become a special education teacher to do so. Yet, halfway through this course COVID shut down campus and we began taking remote courses and teaching remote lesson plans to students. During the time at home, I had quite a bit of time to reflect on my program, which led me to decide to stop out. I believe that attending a liberal arts school, allowed for me to have such a seamless transition into a completely new program in a different state. As, the level of flexibility in the way courses are transferred allows for such a broad range of knowledge.

Looping back to just after I stopped out and first began witnessing the social media videos of students in schools terrorizing one another and their teachers. Followed by the shifts in the education systems, and the increased acceptance and lack of restrictions on technology usage for children brought a newfound passion into the horizon. I had begun reflecting on a class I took in high school, which began my passion for psychology—behavioral science. Which I absolutely adored, partly because of the incredible teacher, also part because of the content itself. This was the first class where I felt for the first time that learning was enjoyable. My reflections on this course, led me to do a bit of research on my own, out of sheer curiosity of various terms and



diagnoses. Yet, at that point I would have told you I do not like research, I realize now I just did not enjoy the topics I was assigned.

Which leads us to my time here at SNHU! Where I transferred in, I did not know entirely what I wanted to do even still. I just knew I needed to return to college and finish my degree finally. In my time of considering the various courses I had taken and my own personal interests, I landed on psychology with a concentration in child and adolescent development initially. Yet, I quickly found a place here and through so many conversations and revelations, I came to terms with the fact that I guess I do like research. Which is I guess how we ended up with me taking a statistical modeling and classifications course, it was never something I thought that I would enjoy or be able to do. It allowed me to better understand where to find sound datasets and how to better read the graphs I've come across. Yet having conversations with the varying majors, who are equally passionate regarding statistics and studies has been so reaffirming. Because even in the psychology department, there are very few of us who enjoy statistics and research I've realized.

My whole bachelor's degree I feel led up to this research question in many ways, it truthfully is a combination of some the topics I have found most appealing over the years. And to finally piece it together in a formal manner and feel like I can see my degree as a whole picture from completing this review. Thank you for helping guide me down this path!

## References

- American Psychiatric Association. (2013). *\*Diagnostic and statistical manual of mental disorders\** (5th ed.). <https://doi.org/10.1176/appi.books.9780890425596>
- Arató, Á., Nagy, S. A., Perlaki, G., Orsi, G., Szente, A. T., Kis-Jakab, G., ... & Darnai, G. (2023). Emotional face expression recognition in problematic Internet use and excessive smartphone use: Task-based fMRI study. *\*Scientific Reports*, 13\*(1), 354. <https://doi.org/10.1038/s41598-022-27172-0>
- Ağırkan, M., Haspolat, N. K., & Çelik, O. (2024). Exploring different technology addiction types in young adults: A latent profile analysis. *\*Current Psychology*, 43\*(33), 27225–27238.
- Beard, K. W., & Wolf, E. M. (2001). Modification in the proposed diagnostic criteria for Internet addiction. *\*CyberPsychology & Behavior*, 4\*(3), 377–383.
- Brynte, C., et al. (2022). [Full source details needed].
- Chmielewski, M., Clark, L. A., Bagby, R. M., & Watson, D. (2015). Method matters: Understanding diagnostic reliability in DSM-IV and DSM-5. *\*Journal of Abnormal Psychology*, 124\*(3), 764–769. <https://doi.org/10.1037/abn0000069>
- Fernandes, B., Maia, B. R., & Pontes, H. M. (2019). Internet addiction or problematic internet use? Which term should be used? *\*Psicologia USP*, 30\*, e190020.
- Hatoum, A. S., et al. (2022). [Full source details needed].
- Hodge, V., & Gebler-Wolfe, S. (2022). [Full source details needed].
- Hruby, T., & Marsalek, P. (2003). Event-related potentials—The P3 wave. *\*Acta Neurobiologiae Experimentalis*, 63\*(1), 55–63.

- Jang, M. H., Kim, M. J., & Choi, H. (2012). Influences of parental problem drinking on Internet addiction among early adolescents: A multiple-mediation analysis. *\*Journal of Addictions Nursing*, 23\*(4), 258–270. <https://doi.org/10.1097/JAN.0b013e31826f69ac>
- Kravchenko, O. (2023). Does addiction skip a generation? Patterns of intergenerational transmission of substance abuse. [Publisher info needed]
- Lin, F., Zhou, Y., Du, Y., & Qin, L. (2012). [Full source details needed].
- Montag, C., & Reuter, M. (2017). *\*Internet addiction: Neuroscientific approaches and therapeutical implications including smartphone addiction\**. Springer.
- Moulton, E. A., et al. (2014). [Full source details needed].
- Qeadan, F., Egbert, J., & English, K. (2022). Associations between problematic internet use and substance misuse among US college students. *\*Computers in Human Behavior*, 134\*, 107327. <https://doi.org/10.1016/j.chb.2022.107327>
- Ranganathan, S., Gribskov, M., Nakai, K., & Schönbach, C. (Eds.). (2019). *\*Encyclopedia of bioinformatics and computational biology\**. Elsevier.
- Riyahi, S., et al. (2024). [Full source details needed].
- Sahanapriya, G. K., et al. (2021). A cross-sectional study on internet addiction among adolescent children of parents with mental illness. *\*Indian Journal of Psychological Medicine*, 43\*(5), 422–427. <https://doi.org/10.1177/0253717621999761>
- Shaw, M., & Black, D. W. (2008). Internet addiction: Definition, assessment, epidemiology and clinical management. *\*CNS Drugs*, 22\*(5), 353–365. <https://doi.org/10.2165/00023210-200822050-00001>

- Silveri, M. M., et al. (2013). Frontal lobe  $\gamma$ -aminobutyric acid levels during adolescence: Associations with impulsivity and response inhibition. *\*Biological Psychiatry*, 74\*(4), 296–304. <https://doi.org/10.1016/j.biopsych.2013.01.033>
- Sutherland, E. (2012). [Full source details needed].
- Trub, L., & Barbot, B. (2016). [Full source details needed].
- Trucco, E. M., et al. (2016). [Full source details needed].
- Waaktaar, T., et al. (2018). [Full source details needed].
- Wei, L., et al. (2017). A tripartite neurocognitive model of internet gaming disorder. *\*Frontiers in Psychiatry*, 8\*, 285.
- Zeng, X., et al. (2024). Similarity and difference in large-scale functional network alternations between behavioral addictions and substance use disorder: A comparative meta-analysis. *\*Psychological Medicine*, 54\*(3), 473–487.