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Original Article

Internet addiction among children: an interdisciplinary medico-legal analysis

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ABSTRACT

Internet addiction among children has become one of the leading health problems for the younger generation and society as a whole in the context of rapid digitalization and global access to online technologies. The purpose of this article is to analyze the phenomenon of Internet addiction in children from a medical and criminological perspective, integrating medical, psychological, and legal approaches. The study is based on the analysis of current empirical data (2019–2026), scientific works by Ukrainian and foreign scientists on children's behavior on the internet, as well as a comparative analysis of international monitoring programs and clinical studies highlighting the medical, psychological, and social consequences of excessive use of digital technologies by children. Particular attention is paid to modern digital-age syndromes such as Facebook depression, cyberchondria, phantom vibration syndrome, and Google amnesia, which increasingly accompany problematic internet use among minors. The article substantiates that uncontrolled digital behavior may act as a risk factor for mental disorders, social maladaptation, deviant behavior, and victimization of children in cyberspace. The results of our study emphasize the need to introduce interdisciplinary measures to prevent Internet addiction, involving parents, educators, medical professionals, and law enforcement agencies.

Keywords: Internet addiction, Children, Mental health, Digital environment

Introduction

The rapid spread of digital technologies has had a profound impact on the development of today's children and adolescents, making the internet an integral part of education, communication, and leisure. Along with its undeniable advantages, excessive and uncontrolled use of digital technologies has given rise to increasing risks to children's health and social development. According to international studies, minors are one of the most vulnerable groups of the population in terms of behavioral addictions, in particular, internet addiction and problematic use of social networks. This vulnerability is due to neuropsychological immaturity, lack of life experience, high suggestibility, and limited ability to self-regulate.

In recent years, Internet addiction has been increasingly discussed not only as a psychological phenomenon, but also as a complex medical and criminological problem. This is explained by the fact that this problem is closely related (correlated) with a number of emotional disorders among active underage internet users, such as aggressive behavior, significant distress, cybervictimization, and decreased social control. For pharmaceutical education and research in the field of health, this topic is particularly relevant due to its importance for mental health prevention, pharmacological interventions for comorbid conditions, and public health policies. Given that children represent the future of society, there is a clear need for a comprehensive medical and criminological analysis of Internet

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addiction among children based on the latest empirical data and interdisciplinary scientific sources [1, 2].

Materials and Methods

Our scientific work is based on a comprehensive analysis of contemporary research. The following scientific methods were used in this study:

- analysis and synthesis – to systematize scientific approaches to understanding Internet addiction;
- comparative method – to compare the results of Ukrainian and foreign studies;
- content analysis of scientific sources – to identify the main medical, psychological, and criminological aspects of the problem;
- interpretative analysis of empirical data from international monitoring programs, clinical studies, and statistical reports from research organizations.

The study is based on the analysis of current empirical data (2019–2026), scientific works by Ukrainian and foreign scientists on children's behavior on the internet, as well as a comparative analysis of international monitoring programs and clinical studies highlighting the medical, psychological, and social consequences of excessive use of digital technologies by children. Particular attention was paid to the analysis of studies addressing modern digital psychopathologies (Facebook depression, cyberchondria, phantom vibration syndrome, and digital amnesia).

Results and Discussion

Our analysis shows that excessive Internet use among children affects their health and causes certain changes in physical, psychological, and cognitive functioning. A significant proportion of adolescents exceed the recommended daily limits for «screen time», which contributes to the formation of stable patterns of excessive use of digital technologies. Prolonged screen time correlates with an increased prevalence of visual strain, symptoms characteristic of computer vision syndrome, sleep disturbances caused by the suppression of melatonin under the influence of blue light, chronic fatigue, and musculoskeletal disorders, including neck and back pain associated with prolonged static posture. Over time, these physiological changes can cause not only temporary discomfort but also long-term complications and deterioration in health that will require medical attention.

On a psychological level, a clear link has been found between intense online activity and increased levels of anxiety, emotional instability, irritability, and depressive symptoms. Social networks reinforce social comparison mechanisms, which negatively affect adolescents' self-perception and self-esteem, lowering it. It should be noted that teenage girls are a particularly vulnerable group. Such prolonged daily exposure to idealized images contributes to dissatisfaction with one's own appearance and personal achievements, thereby reinforcing feelings of inferiority and, as a result, social isolation. In addition to traditional emotional disorders – anxiety, irritability, signs of depression – researchers are observing an increase in the prevalence of phenomena characteristic of the digital age, in particular, compulsive searching for medical information, accompanied by increased anxiety about one's own health, constant anticipation of notifications or calls on a smartphone (phantom vibrations) and a constant need to stay connected in the digital space.

Moreover, dependence on digital gadgets and the internet contributes to cognitive changes that are often described as digital or «Google» amnesia. This behavioral pattern negatively affects motivation to memorize independently and critically process information, thereby weakening concentration, analytical thinking, and the development of long-term memory. For children and adolescents, whose neural structures are in the process of active formation and development, such trends can negatively affect academic performance, deep learning processes, and the development of stable cognitive skills necessary for future professional and social functioning.

From a criminological perspective, excessive immersion in the digital environment increases minors' susceptibility to cybervictimization, manipulation, online grooming, cyberbullying, and exposure to harmful or extremist online communities. Emotional vulnerability, reduced impulse control, and a heightened need for digital stimulation may facilitate risk-taking behaviors and social maladaptation. In certain cases, these factors contribute not only to victimization but also to the adoption of deviant behavioral patterns within online and offline contexts.

Overall, the results confirm that internet addiction among children should be considered a systemic medical and criminological problem rather than a narrowly defined behavioral habit. Its multidimensional consequences require early diagnosis, preventive monitoring, and coordinated interdisciplinary intervention with the active participation of parents, teachers, medical professionals, and law enforcement agencies.

The term «internet addiction» was initially introduced by Ivan Goldberg in 1995 to describe compulsive and maladaptive patterns of internet use. Subsequently, Kimberly Young systematized the concept and proposed diagnostic criteria by adapting models of pathological gambling [3-6]. Over the past decades, the terminology has evolved, incorporating notions such as «problematic internet use», «pathological computer use», and «internet use disorder».

The World Health Organization does not officially recognize internet addiction as a separate diagnosis. However, gaming disorder has been included in the ICD-11 [7-10], which indirectly confirms the clinical significance of behavioral addictions associated with digital technologies. Contemporary empirical studies increasingly emphasize that internet addiction in children is often accompanied by anxiety disorders, depression, attention deficit/hyperactivity disorder (ADHD), and sleep disorders. In addition, teenage girls often restrict their eating in pursuit of

perfect photos on social media, which increases the risk of developing anorexia.

According to the results of a study by Spanish scientists, excessive use of the internet by children has a negative impact on their emotional state in childhood and adolescence. The authors identified stable trajectories of comorbidity and highlighted key mediators, such as low self-esteem and maladaptive strategies for emotional regulation [11-14].

According to data presented in numerous studies, most adolescents significantly exceed the recommended limits for screen time, spending more than 6 hours a day on the internet, with some being «always online» [15, 16]. These data are consistent with international surveys, such as the Health Behaviour in School-aged Children (HBSC) study, which confirm the growing difficulty adolescents experience when attempting to reduce their online activity [17].

Meanwhile, according to research by scientists at Oxford University, the ideal amount of time for using a PC and other electronic devices that is beneficial for a child's brain is 4 hours and 17 minutes. It is better to spend no more than two hours on a smartphone and up to 100 minutes a day playing video games. This is enough time to develop social connections and skills, but after this time, gadgets begin to have a negative impact on children's brains [18-21].

We should also mention the work of Jonathan Chu and his co-authors, who in their two-year study «Screen time and suicidal behaviors among U.S. children 9-11 years old: A prospective cohort study» emphasize that each additional hour of total screen time significantly increases the chances of suicidal behavior in children [22-25].

Given the above, the question arises: what attracts children to virtual space, and why do they want to be online all the time? Perhaps it is because the World Wide Web provides a unique opportunity for online relationships to satisfy unmet social needs in real life. Individuals (especially adolescents) who feel misunderstood and lonely may use virtual relationships to find a sense of comfort and community**.** However, this "replacement" of real relationships carries certain risks. Author K. Young noted in her study that «the Internet may pose a potential clinical threat, where little is known about treatment options» [3].

In addition, it should be emphasized that prolonged and uncontrolled exposure to the online environment has a complex negative impact on a child's body. The most dangerous consequences are associated with the destabilization of the psycho-emotional state and the development of mental disorders [26-30].

Empirical studies by domestic and foreign authors [15, 31, 32] indicate a statistically significant relationship between prolonged Internet use and increased levels of irritability, emotional instability, apathy, and depressive symptoms in children. For three years, researchers from the University of California, San Francisco, monitored almost 12,000 children aged nine to 13. It turned out that the more time adolescents spend on social networks, the higher their risk of developing depression. «Social networks are indeed a risk factor for developing depression in the future or worsening depressive symptoms», explained the head of the study, Jason Nagata. He noted that this effect works only in one direction: «Children who already had depression did not necessarily report using social networks more often in subsequent years». Daily time spent on social networks increased tenfold over three years, from seven to 74 minutes. Along with this, symptoms of depression increased by 35% [33, 34].

A particularly alarming condition is depression, which is recognized as one of the leading causes of disability among adolescents worldwide. Approximately half of mental health disorders manifest before the age of 14, yet remain undiagnosed and untreated, thereby increasing the risk of chronic mental illness in adulthood.

According to the results of a study conducted by Ukrainian scientists, it was found that a large percentage of students do not control the time they spend on their phones. More than 90% of children and adolescents use gadgets every day, which was completely expected. Most of all, children and adolescents like to use social networks, but very few students use gadgets for learning. Almost half of the surveyed students play computer games. Another negative conclusion the authors drew from the survey was that 63% of parents never forbid their children from playing computer games [35-37].

As mentioned earlier, excessive use of the internet and modern digital technologies can harm both a child's physical and mental health. When it comes to physical health and the somatic consequences of excessive exposure to the digital environment, the visual system is the first to suffer. Constant focus on the screen leads to the development of computer vision syndrome (CVS) [38, 39]. Studies show that the prevalence of dry eyes and digital eye strain among children has increased significantly since 2020, as children around the world have been forced to switch to distance learning due to COVID-19 pandemic-related measures.

Uncontrolled internet use by children also often leads to sleep and circadian rhythm disorders, as the blue light emitted by screens suppresses melatonin production. This contributes to delayed sleep phase and chronic fatigue. This is confirmed by research conducted by Korean scientists, who have proven a correlation between excessive smartphone addiction and poor sleep quality, as well as depression among Korean teenagers [40, 41]. This also has a negative impact on the musculoskeletal system: prolonged static posture causes neck and back pain, as well as spinal curvature. This leads to the development of the so-called «text neck syndrome». Furthermore, excessive presence in the digital environment negatively impacts a child's mental health and emotional stability. Studies confirm that intensive use of social networks predicts the development of depressive symptoms through the mechanism of social comparison [42]. Additionally, children showing signs of internet addiction demonstrate higher levels of irritability, apathy, and emotional instability due to neuropsychological immaturity [11, 43].

They experience discomfort or panic when unable to use the internet, or the fear of losing their phone or connection (nomophobia, etc.) [44].

It is important to note that with the development of the digital age, new psychopathologies have emerged, often comorbid with

classic disorders. Specifically, «Facebook depression» refers to a state where online users, including minors, experience depressive symptoms due to the discrepancy between their own lives and the «ideal» images of other users on social media. Constant comparison lowers self-esteem, leading to feelings of social isolation [45]. «32% of teenage girls said that when they felt bad about their bodies, Instagram made those feelings worse» – according to data published by LB.ua [46], citing journalists from The Wall Street Journal.

Another danger to the health of internet users, including children, is cyberchondria, defined as increased anxiety and health-related distress resulting from excessive online searching for medical symptoms or risks. This is a new mental health problem in the digital age [47, 48]. For children, it is dangerous due to the development of hypochondria and a tendency toward uncontrolled self-medication.

An additional mental health issue caused by excessive «smartphonization» is Phantom Vibration Syndrome, a false sensation that a phone is vibrating or ringing. This is a sign of psychological overstrain and «digital alertness», where the brain is in a state of constant expectation of a notification. American researchers note that 89% of a sample of 290 students experienced phantom vibrations, occurring on average about once every two weeks [49].

The problem of the memory displacement effect, known as «Google amnesia», deserves attention and further research. This refers to the brain's tendency to forget information that can easily be found online. Yalçın Kanbay and co-authors (2024) [50] note that digital amnesia is a condition where memory capacity decreases as a result of changes in our habits regarding information access and storage, facilitated by numerous functions of modern digital devices and the internet. Furthermore, the research company Opinion Matters surveyed 6,000 residents of Europe, the USA, and India aged 16 to 55 [51]. The results were surprising: people are more accustomed to trusting information from the Web and smartphones than their own memory. The vast majority of gadget users admitted their dependence on electronic devices as tools for knowledge storage. Almost all respondents (91%) agreed that they use the internet as an «additional memory» for their brains. Only one-fifth (21%) stated they rely exclusively on their own memory. 44% of respondents from European countries and 50% from India noted that the smartphone functions as a memory bank, and they begin to «Google» before attempting to recall a fact independently. Almost half of the respondents admitted to forgetting facts found in search engines instantly.

This is especially dangerous for kids because it messes with how their long-term memory develops and makes it harder for them to really think things through and learn. This is especially dangerous for children, as it interferes with the development of their long-term memory and complicates the process of thinking and learning. A group of Chinese scientists has proven in their research that excessive exposure to the digital environment can cause children to experience a decline in academic self-efficacy, as their ability to cope with academic difficulties and find meaning in life is impaired by pathological internet use [52].

Regarding the legal aspect of our study, it should be noted that thanks to the use of the latest information and communication technologies, a significant number of «ordinary» criminal offenses have today moved to the category of so-called «cybercrimes» in the broad sense of the word.

The victim of the above-mentioned illegal acts can be any person who uses modern means of communication or the internet. The particular danger of such acts lies in the fact that minors often become their victims, because, as mentioned above, they are the most active users of the internet and other means of communication. In addition, parents often do not know what sites their children visit, which also contributes to the latency of cybercrimes in relation to children.

Thus, today, the task of every state is to respect the rights of the child in the digital environment and ensure its protection from dangerous encroachments, including offenses, harmful content, and the negative impact of the Internet environment, preventing Internet addiction, and without violating the child's right to free expression of opinion and receipt of information.

In order to prevent internet addiction and negative phenomena affecting children, preventive measures must be taken at various levels. In particular, at the family level, parents need to set clear time limits on the use of gadgets, taking into account the age of the child, and introduce family rules of «digital hygiene», such as no gadgets 1-2 hours before bedtime and limiting their use during meals. Parents should serve as role models through their own moderate use of technology, encourage alternative activities such as sports, creativity, and live communication, and conduct discussions with the child regarding the risks of the online environment. At the level of educational institutions, it is necessary to implement digital literacy and media education programs, systematically familiarize children with information about digital risks, such as cyberbullying, mechanisms of online fraud, and manipulation. It is also advisable to offer psychological support to children who show signs of addictive behavior, and regulate the use of smartphones in the educational process. At the state and community level, efforts should focus on improving mechanisms for protecting children in the digital space, supporting national programs and public initiatives aimed at forming a safe digital environment, and conducting information campaigns regarding responsible Internet use.

Conclusion

Internet addiction among children is a complex problem that has not only psychophysiological, but also criminological consequences. Excessive, uncontrolled stay in the digital environment has a detrimental effect on the child's health, causing various disorders: in particular, computer vision syndrome, sleep and circadian rhythm disorders, posture problems, «text neck», and chronic fatigue. At the same time, the mental health of underage Internet users also suffers significantly – the level of anxiety increases, depressive manifestations and emotional instability appear, and

nomophobia, cyberchondria, phantom vibration syndrome, Facebook depression, and digital amnesia take root.

The impact of the digital environment on children's cognitive development poses a particular danger. Dependence on gadgets as «external memory» leads to weakened long-term memory mechanisms, reduced concentration, and a diminished capacity for deep learning, negatively affecting the intellectual development of minors.

In criminological terms, Internet addiction increases the vulnerability of children to online manipulation, which can lead to various types of offenses against the child, including cyberbullying, online grooming, participation in illegal activities, and destructive online communities. Psycho-emotional instability, reduced self-control, and the need for constant digital stimulation can act as factors of deviant behavior. Thus, Internet addiction is not only an individual medical problem, but also a factor of potential criminogenic risk. Therefore, the problem requires an interdisciplinary approach, which can only be solved by a comprehensive approach combining medical, psychological, pedagogical, and legal response mechanisms.

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