

# **Internet Addiction: A Review of Associated Health Hazards**

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## **Introduction**

With the invention of the microprocessor *circa* 1970, humanity was catapulted into the Information Age. Following *Moore's Law*, the microprocessor has essentially doubled in complexity, capacity, and capability every two years since that time. As a result, today's personal computer is vastly more powerful than the mainframe supercomputers of decades past. This radical increase in computing power, coupled with an explosion in Internet bandwidth and access technology, availability, and online services represents the 21<sup>st</sup> Century equivalent of the Industrial Revolution, in terms of productivity, commerce, and change in lifestyle.

Certainly, the computer and the Internet provide tremendous educational and professional benefits including access to information about wide ranging topics and enhanced communication between students, teachers, and colleagues. However, the Information Revolution, as with all technological advances, carries unforeseeable costs. In particular, significant health hazards are associated with various information technology portals. Specifically, problematic or pathological computer use has been implicated in decreased performance at work and school, straining of family and other interpersonal relationships, and the development or exacerbation of mental health illness<sup>1</sup> In addition, a spectrum of other conditions related to excessive computer use have been documented.

Problematic or pathological computer use consists of excessive computer use and the inability to control such use resulting in interference with daily life outside the computer interface. Although the scientific community has not generally agreed upon a standardized definition, problematic or pathological Internet use has existed in the public consciousness for over a decade. Therefore, for the purposes of this discussion, the spectrum of disorders relating to problematic or pathological Internet use will be referred to as *Internet addiction*. With one billion personal computers in use, worldwide, as of June 2008 and another billion expected to be in use by 2014, the issue of Internet addiction is almost certain to become increasingly problematic. Internet addiction and the related clinical implications may serve as a model for potential health hazards associated with the use of information technology in the early 21<sup>st</sup> Century.

## **Internet Addiction as a Primary Disease**

Conceptually, Internet addiction is a compulsive-impulsive spectrum disorder involving pathological computer usage.<sup>2,3</sup> Internet addiction is composed of at least three distinct variants—excessive gaming (generally online, though may include and offline component), sexual preoccupation (pornography), and excessive e-mailing/text messaging (electronic communications). Each subtype includes the following components: (1) *excessive use*, frequently punctuated by a loss of the sense of time and a neglect of basic physical needs such as eating, sleeping, bathing, and physical activity;

(2) *withdrawal*, including symptoms such as anger, depression, and anxiety when the computer cannot be accessed, for whatever reason; (3) *increasing tolerance*, basically amounting to obsession with obtaining more and better computer equipment and software or more hours of computer use (and time online), and; (4) *negative repercussions*, such as social isolation, lack of interest in other endeavors, poor performance at work or school, etc.<sup>4,5,6</sup>

Whether Internet addiction is a primary psychiatric disorder or a secondary manifestation of another behavioral disorder remains a topic of controversy within the psychiatric community. Some researchers have postulated that Internet addiction actually represents a symptom of underlying primary depression or personality disorder and may be a sort of self-medication to alleviate the discomfort associated with the primary disorder.<sup>7</sup> However, the fact remains that the *Internet experience* consists of distinct qualities making it the potential object of addiction, qualities such as “interactivity, online anonymity, and the satisfaction of a user’s novelty-seeking propensity.”<sup>8</sup> Recent advances in understanding of the functional mechanics of the reward system of the human brain, primarily gleaned from new imaging technologies, suggest that the brain perceives a “reward” in the same way, regardless of whether it originates from an external experience or an internal biochemical variation. “And every time there’s a reward, there’s the associated risk for the brain of getting trapped in compulsion.”<sup>9</sup> Additionally, functional similarities between substance-related and behavioral addictions have been noted at both physiological and psychosocial levels, further blurring the distinction between primary diagnosis and secondary co-morbidity.<sup>10</sup>

While few large-scale epidemiological studies examining the extent of problematic Internet use have been undertaken, existing data suggests that it is a global phenomenon, impacting individuals of varying age groups, with prevalence rates approaching those of schizophrenia and bipolar disorder.<sup>11</sup> However, in the developed world, children and young adults, in particular, are widely exposed to computer technology both in the home and in the classroom. Consequently, computer systems and the Internet may represent a more integral part of life for individuals in these age groups relative to those consisting of individuals who passed this station in life prior to the widespread use of the computer and availability of the Internet. Additionally, adolescence appears to be the most critical period of vulnerability to addictive disorders, both substance- and non-substance-related, based not only on social, but also neurobiological factors.<sup>12</sup> For this reason, mental health professionals involved in the care of adolescents and young adults should remain vigilant for signs and symptoms suggesting problematic or pathological computer/Internet use.

Multiple recent studies suggest that Internet addiction is much more likely to affect males than females—2-7 times more likely, depending on the study cited.<sup>13</sup> This apparent predisposition on the part of studied males may be indicative of basic differences in the way members of each sex tend to utilize the Internet. Specifically, males appear to be more likely to use computer technology for gaming, gambling, and sexual pursuits, activities around which addictive online behavior appears to be organized. Conversely, one recent study of Internet users in Hong Kong found that the participants who met the study criteria for Internet addiction were primarily adolescent females who logged

significant time using an instant messaging (communication) application known as *ICQ*.<sup>14</sup> Further study of the demographic factors related to increased risk of Internet addiction will be of great utility in better understanding the nature of this disorder.

Individuals who exhibit problematic Internet use typically spend a significant amount of time engaged in online activity; time that might ordinarily be apportioned to family, professional, educational, or social activities. Numerous anecdotal reports of Internet addiction have described weekly Internet use in excess of 35 hours per week. The individuals described in these case reports consistently underestimated the amount of time devoted to online activities. It has been suggested that this tendency toward underestimation of time spent online is the result of “time distortion, impaired recollection, [and] shame/guilt regarding reporting of actual time spent online.”<sup>15,16</sup> Multiple studies have suggested that increased virtual interaction results in decreased interaction in the user’s real life outside the computer interface. This may lead to depression and feelings of social isolation. Although Internet use has not been specifically implicated as an etiologic factor in the development of depression, it has been associated with “psychological distress and loneliness.”<sup>17,18,19</sup> Adverse social consequences related to problematic Internet use include academic failures, job losses, financial difficulties, legal problems, family conflicts, and divorce (with most such disruptions related to “cyberaffairs”).<sup>20,21</sup>

In addition to consuming vast amounts of time and resulting in an array of social and functional impairments, problematic Internet use carries other direct health risks. Among these health risks are musculoskeletal discomfort and pain (including repetitive stress injuries such as Carpal Tunnel Syndrome), blurred vision, sleep deprivation and malnutrition, and fatigue.<sup>22,23</sup> Ha et al identified a wide-range of impairments associated with Internet addiction including “psychophysiological problems, such as insomnia, tension headache, and dry eyes.”<sup>24</sup> Online activity may also be associated with criminal endeavors such as theft, substance-related offenses, and sexual predation. In fact, pathological Internet use has been implicated in at least one murder, as well as the death of a 28-year-old man who had engaged in 50 consecutive hours of play in an online role-playing game<sup>25,26,27</sup> Additionally, a 13-year-old high school junior jumped to his death from 24-story building after, reportedly, 36 straight hours engaged in another online role-playing game. This individual left behind a suicide note outlining the reason for his suicide: He wanted to join the heroes of the game that he worshipped.<sup>28</sup> These extreme cases likely probably other psychiatric pathology beyond Internet addiction. However, Internet addiction *was a distinct factor* in each case.

### **Psychiatric Co-Morbidity**

Few studies have undertaken to determine the extent to which psychiatric disorders comorbid with Internet addiction occur. However, such studies involving substance abuse disorders and pathological gambling, to which Internet addiction has been compared, have suggested that psychiatric co-morbidities occur commonly in conjunction with these illnesses. Co-morbidity of two disorders may rise from common etiology or from a causal

relationship. Regarding Internet addiction, additional study will be required to make such determinations.

In a recent study by Ko et al involving 216 Taiwanese college students, logistic regression analysis found that those studied with Internet addiction were more likely to suffer from concomitant major depression, dysthymic (bipolar) disorder, and adult attention-deficit/hyperactivity disorder (ADHD) than were those unaffected by Internet addiction. No relationship between Internet addiction and social phobias was noted in this study.<sup>29</sup> Studies by Shapira et al and Black et al indicated that Internet use behaviors among those studied with Internet addiction “fulfilled *DSM-IV* criteria for an impulse control disorder not otherwise specified”<sup>30,31</sup> and a study by Yang et al suggested that excessive Internet use was associated with a higher prevalence of obsessive-compulsive symptoms and a higher level of psychiatric symptoms, in general.<sup>32,33</sup>

A number of other psychiatric disorders have been correlated with problematic Internet use including substance use disorder, personality disorders, anxiety disorders, and psychotic disorders. Of these co-morbid conditions, substance use disorders were the most common, occurring in 38% of patients in the Black study and 55% of patients in the Shapira study. Personality disorders were also found to occur commonly with “cluster B disorders (narcissistic, borderline, and antisocial types) most frequently observed.”<sup>34,35,36</sup> Addictive disorders such as substance use disorders and pathological gambling tend to have a high rate of psychiatric co-morbidity. This tendency also holds true for Internet addiction, again raising the question as to whether Internet addiction (and, possibly, all addictive disorders) represents a distinct disease or a secondary manifestation of another pathological process. Indeed, problematic Internet use may be “a maladaptive coping strategy in response to psychological symptoms, an expression of other primary psychiatric disorders, or may stem from common biological causes.”<sup>37,38,39</sup>

## **Conclusion**

Problematic or pathological Internet use has been an issue of public and scientific debate for over a decade. Despite the ongoing question as to whether the spectrum of behavior that can be termed *Internet addiction* is a discreet psychiatric disorder or secondary symptom of another illness, problematic or pathological Internet use clearly represents a health risk for a significant portion of the population of the developed world. Epidemiological data has demonstrated clear social, functional, physical, and psychological impairments in individuals with Internet addiction. Most Internet users utilize the technology, both for professional and recreational purposes, in a responsible and reasonable fashion. However, a significant number of people who use this technology are at risk for a range of morbidities and, in the extreme, even mortality, as a result. The core issue at hand appears to be *the potential for the individual user to develop an abnormal relationship to and reliance on information technology*. With continuing advances in computing and Internet power and availability, this issue is likely to become increasingly prevalent. As such, Internet addiction and its related consequences may serve as a cautionary model for the potential health hazards of the unchecked use of information technology in the 21<sup>st</sup> Century.

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