

## Pathological Use of Electronic Media: Case Studies and Commentary

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**Abstract** Since its formal introduction barely a dozen years ago, internet addiction (IA) has been both increasingly researched and much debated. The majority of studies have been conducted on large populations through internet surveys, with the most popular instrument for assessing IA being the Internet Addiction Test (IAT). However, both the large scale anonymous survey approach and the design and application of the IAT yield limited clinical insights. IA and the recently proposed more encompassing term of Pathological Use of Electronic Media (PUEM) require more exquisite understanding for essential and timely incorporation into DSM-5 nosology. This study presents four cases modifying the IAT for application within a structured individual interview. The findings are discussed in regard to both the clinical benefit of the procedure and considerations of PUEM for its role in DSM-5.

**Keywords** Electronic addiction · Non-substance addiction · Compulsive–impulsive spectrum

### Introduction

The internet became a central feature of communication in the 1990s. The degree of its influence was so rapid and pervasive in advanced countries that the notion of internet addiction was already being proposed by 1996 [1]. During the first decade of the twenty first century, the extent of internet use has made a phenomenal expansion. With over a billion new users since 2004, the worldwide estimate is now 1.8 billion [2].

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A review of the literature addressing internet overuse yields several central issues. The most salient is the debate over interpreting and defining the phenomenon from within either a clinical or psychometric domain. Young's original formulation for internet addiction (IA) was derived from impulse control disorder, specifically the criteria for pathological gambling [1]. Psychiatrists who have led inquiry into the area emphasize PUEM as a distinct entity meriting inclusion in DSM-5. A current leading proponent of inclusion of IA in DSM-5 builds more broadly on this clinical view by stating that "the diagnosis is a compulsive–impulsive spectrum disorder" [3]. Shapira suggests the best classification is that of an impulse control disorder not otherwise subsumed by a hypomanic or manic syndrome [4]. His seminal contribution pointed out that within the psychological literature on pathological Internet use, there lacked any studies using face-to-face standardized psychiatric evaluations. Both from his own effort in that regard and a later review of the literature, Shapira emphasizes the co-morbid nature of the disorder, and deferred assigning the term internet addiction while likewise concluding that "problematic internet use" may best be classified as an impulse control disorder [5]. In a comprehensive essay, Morahan-Martin supports this view by concluding that it may be most productive given the diverse nature of the available research to regard Internet abuse as co-existing with other psychopathology "without specifying one as the cause or the symptom of the other" [6].

Block's assertion of a specific disorder within a compulsive–impulsive spectrum with three predominant sub-types (excessive gaming, sexual preoccupations and e-mail/text messaging) both broadens the diagnostic realm and makes clear the need to apprehend the problem beyond the internet alone [3]. Pies goes further still in hypothesizing obsessive-compulsive/ego-alien and impulsive/ego-syntonic subtypes while also suggesting the need to recognize the likelihood of mixed features. As Shapira did early on, he also notes the inevitable further condition wherein PUEM is going to be secondary to a primary mood, anxiety or personality disorder [7].

Criticism of recognizing IA at all is most convincingly focused on problems to date in its psychometric measurement. Grohol points out that most studies are designed merely to identify characteristic features associated with susceptibility to IA. Arguing that the complex nature of the concept begs a body of theory-based academic research, he emphasizes the absence of a valid standardized approach that tests causal relationships rather than merely inferring the degree of associations [8]. The most widely-used instrument for measuring IA is Young's own Internet Addiction Test (IAT), and Grohol has been a vociferous critic of it [9]. In their metasynthesis of the last decade of research on IA, Byun et al begin by discussing the complex and multi-faceted nature of the problem leading to a persistent lack of a clear definition from which to proceed with systematic and uniform studies [10]. They go on to outline a rigorous critique of the psychometric underpinnings of the existing research per se, noting in particular a heavy sampling bias toward very young populations, weak data analysis, and the limitations of internet-based surveys.

Indeed, there is no lack of irony in primarily relying on the Internet to attempt to understand it as a form of psychopathology. Large-scale surveys—typically conducted on Chinese youth—relying on self-report of use behavior and personality characteristics beg both exquisite clinical insight or generalization to the target population worldwide [11–18].

The present investigation was undertaken bearing in mind concerns with both definition and method. A singular emphasis on the Internet ignores the broader phenomenon of the current state of abuse of personal technology. Indeed, one need not be restricted to a computer or the Internet per se to become overly consumed with an electronic device. The obvious alternative medium is the cell phone. Consider that the International

Telecommunication Union—a United Nations agency—recently reported that worldwide mobile cellular subscriptions have reached 4.6 billion. Moreover, this figure does not account for the unsubscribed. Cell phone subscriptions in the United States are at 270,000, or nearly 90% of the population [19]. Thus for the factors of need, access, convenience, affordability and inclination, several billion more people are using cell phones than the Internet. Given the increasingly consuming options for engagement offered by cell phones, as an electronic medium they are certainly no less ripe for abuse than the Internet.

In regard to the problem of definition, the recent overview and analysis by Pies is very useful. He concludes that the term *pathological use of electronic media* (PUEM) is more encompassing than Internet addiction and incorporates new electronic technologies “...without endlessly multiplying psychiatric diagnoses.” While arguing against PUEM as yet sufficiently understood to be accepted as a discrete disorder or disease, he does purport that PUEM-type symptoms—including those corresponding to IA—could be diagnosed within the DSM-IV category of impulse-control disorder not otherwise specified “(312.30)”. In milder or transient cases, Pies recommends the appropriateness of applying a “V” code, probably most often (V62.89) “phase of life problem.” In all cases, he emphasizes that in proceeding clinically, the focus is to determine which came first; a pre-existing mental disorder that finds expression as PUEM, or PUEM that became the basis of a mental disorder.

A key focus is of course the attempt to determine the predominant neuropsychiatric underpinnings of the syndrome. The predominant and most compelling view is to classify PUEM as a distinct disorder of the compulsive/impulsive spectrum, with sub-types. A leading proponent of this outlook has opined that PUEM appears to have a primarily psychological rather than physiological basis [20]. However, quite recent investigations are beginning to report neural substrates. A subject group evaluated as Excessive Internet Users (EIU) had higher frequencies of SS-5HTTLPR than controls [21]. Another study also relied on the classification of EIU and found such subjects had a significant decrease in P300 amplitudes and increase in P300 latency, most notably in the central parietal region bilaterally [22]. Ten subjects determined to have on-line gaming addiction underwent fMRI and exposure to target stimuli and showed enhanced right-orbitofrontal/nucleus accumbens/caudate/dorsolateral prefrontal/bilateral anterior cingulate and medial frontal activation [23].

In spite of Grohol’s vigorous criticism of the IAT, its essential psychometric properties were affirmed in a study [24]. However, for clinical purposes there are many limitations as noted with relying solely on a fixed-question, self-report inventory. Beyond the obvious problem of respondents under-reporting or being influenced by collaborating on their answers, content analysis of IAT items by the first author (a clinical psychologist) made it evident that the factor of answers being time-bound could greatly detract from accurate understandings of a respondent’s true history. Items 5 and 6 are illustrative. Item 5 asks how often others complain about your time spent on-line. Two of the respondents within the present study answered *rarely*. The advantage of the modified face-to-face approach administered herein allowed for further query and clarification. Thus the examiner was able to ascertain that both respondents were recently separated. Yet while cohabitating for several years, their degree of on-line use was a source of major conflict with their significant other and contributed to the relationship failure. Nonetheless both respondents answered to their current status of living alone. When asked to answer in respect to their much longer term history of co-habitation, both responses were changed to *frequently*. Similarly, Item 6 asks how often academic performance suffers due to time spent on-line. The modified administration allowed the examiner to learn in one case that the respondent

answered *does not apply* because he was no longer in school. However, during the latter 2 years at a major university, the respondent confirmed that in fact his academic efficiency and performance suffered significantly because of the volume of time he was distracted by unrelated on-line activity. Bearing that history in mind he altered his response to *often*.

The first author conferred with IAT developer Young to discuss his concerns with items, intent to modify its administration for face-to-face use, and further perhaps develop an IAT-R wherein items could be re-written to account for current weaknesses. Young was encouraging on both accounts.

We present four cases wherein use of the internet presents as pathological on account of causing impairment in one or more domains of psychosocial function. Subjects were recruited by the first author based on his awareness of their internet behavior. Each case responded to a modified version of the IAT administered face-to-face as part of a clinical interview predicated on their internet behavior.

## Case Reports

### Case 1

A 24 year old Caucasian male with a history of marginal psychosocial function, known in the community by the first author who administered a 90 min interview. Early childhood was remarkable for neglect and abuse both emotional and physical. A dramatic example of the latter is reported as: “My step-father tried to drown me in the sink when I was about 3.” He was diagnosed and medicated in childhood and adolescence for attention deficit and conduct disorder(s). “I think at one time or another they labeled me everything under the sun. One shrink said I was borderline.” He recalls being prescribed primarily methylphenidate and clonidine beginning at approximately age 11, but ceased taking all medications by age 15. Possessed of high native intelligence, his formal education ended in the tenth grade. He obtained a GED. Work history is limited to episodic manual labor; however, he developed significant computer skills independently. By age 17 he was living alone in a Great Lakes region city in an agency-supported apartment. It was during a long winter, unemployed from his seasonal construction job, that he became consumed with the internet and video games after being given a stolen computer by an acquaintance. Other than electronic communication he remained isolated except for the essential contact of late night outings to get junk food. His sleep/wake cycle reversed to nocturnal: “I don’t think I saw daylight for three months.”

Upon venturing to the mall in the Spring he weighed himself and discovered he had gained 80 pounds to 335. On a blog he became acquainted with a woman 10 years his senior in another state several hundred miles away. Within 2 months he had decided to relocate to where she lived. The woman was unemployed and living on psychiatric disability benefits. Possessed of a similar developmental, educational and work history, she also was self-taught in high-level computer skills and spent all of her time alone on-line. Upon co-habiting he quickly realized the extent of the woman’s dysfunctional behavior. She drank heavily and while he abstained from alcohol, he joined her in severely abusing dexamethorphan. She assaulted him on numerous occasions due to his preoccupation with internet pornography and ignoring her. Nonetheless they married in a civil ceremony and produced a child in spite of the woman’s history of abandoning two others. He successfully applied for psychiatric benefits. He was observed to be dysthymic for a year but refused medication. Intermittently he continued to abuse dexamethorphan and was

hospitalized after a severe episode of anxiety. He reported being virtually sleepless for months on end due to being up all night on-line and then having to help take care of the infant during the day. His computer activity was a combination of gaming and pornographic sites, and to a much lesser extent blogging. After the woman assaulted both himself and the responding police, the infant was removed by child protective services and the woman jailed. He relocated back to his native state to reside with his mother and grandmother on the latter's rural property. He resumed his internet lifestyle until recently reporting that "my computer burned out and I can't afford another one. I'm looking for parts so I can build my own." He met another unemployed woman with a young child and wants to find work and secure independent housing for the three of them. He still receives psychiatric disability payments. Score on the IAT-M was 63, the mid-range of moderate impairment. Intra-item scores endorsed as *always* (or 5 points) were (1) how often do you find you stay on-line longer than you intended, (9) how often do you become defensive or secretive when asked what you do on-line, (10) how often do you block out disturbing thoughts about your life with soothing thoughts of the Internet, and (14) how often do you lose sleep due to late night log-ins? Being consumed by internet and gaming activity is primarily ego-dystonic. The lack of employment and meaning in his life causes anxiety and depression. Use of psychotropics during his lifetime is confined to methylphenidate for ADHD ages 10–13.

## Case 2

A 22 year old Caucasian male with a history of minimal psychosocial function, known in the community by the first author who administered two interviews. Early childhood was remarkable for emotional and physical neglect and abuse. He was placed in foster care 11 months after being found "caked in my own s—t 'cuz my mother was a crack head." Moreover, "My foster parents pinned me down and lit my hair on fire 'cuz I didn't want to get a haircut." He was hospitalized at age 5 and diagnosed with schizophrenia. Life upon discharge nearly a year later was remarkable for school expulsions, various foster and group home placements, criminal justice system involvement, nicotine addiction and poly-substance abuse. When reliably supervised he was medicated with bupropion, quetiapine, and valproic acid. During latency he became consumed with video games. He was relocated by a foster mother to her relative in another state and was soon abandoned, placed in an institution for delinquents at age 14, and discharged upon majority. He had ceased all prescriptions upon institutional discharge. Formal education ended in ninth grade and he never obtained a GED. He drifted to a nearby university town and assumed a homeless lifestyle, falling into homosexual prostitution for housing and cash. He began dealing drugs and smoking marijuana incessantly in addition to episodic use of other recreational drugs, including "acid and 'shrooms." There were episodic involvements with the criminal justice system for using marijuana, shoplifting, assaulting another person and trespassing. After a year he was taken in by a gay lover 35 years his senior. This allowed him unlimited computer access and he assumed an entirely nocturnal sleep/wake cycle, spending all afternoon and night until 8 or 9 AM on-line, largely in chat rooms, blogs and playing video games. He particularly enjoys his skill at being able to prey upon vulnerable other persons in chat rooms through masking his identity or assuming multiple ones, and ultimately deceiving them into thinking that he intuited the most painful details of their lives and can foresee their future. He is often in the company of one or more friends functioning at a similar level. He abuses THC continually while awake but has abstained from other substances for approximately 2 years. He is a heavy cigarette smoker. During the last

2 years he has remained in that housing arrangement on a platonic basis, unemployed and living the same lifestyle. Of note is his report of having occasionally indulged in vampire rituals, wherein he draws blood from self and others, stores it in the refrigerator and consumes it. He denies experiencing any auditory hallucinations for many years. Score on the IAT-M was 75 or the upper range of moderate-severe impairment. Intra-item scores endorsed as *always* were (1) how often do you find you stay on-line longer than you intended, (2) how often do you neglect household chores because of being on-line, (7) how often do you check e-mail before something else you need to do, (10) how often do you block out disturbing thoughts about your life with soothing thoughts of the Internet. (12) How often do you feel that life without the Internet would be boring, empty and joyless, (14) how often do you lose sleep due to late night log-ins, and (16) how often do you find yourself saying ‘just a few more minutes’ when on-line. It was the examiner’s impression that the subject was non-defensive in completion of the IAT-M. The domination of his life by electronic activity is ego-syntonic.

### Case 3

A 29 year old Caucasian male with a history of sub-optimal psychosocial function. An only child of professional parents, childhood was remarkable only for the death of his mother when he was 14. He graduated from a major university on schedule, but found his recreational on-line time significantly compromised academics. Thereafter he went to London to manage a punk rock band. He summarizes the experience as “three years sleeping on a couch in a freezing flat and living on potatoes.” He returned to the U.S. and moved to New York City and secured a sales position on Wall Street. He describes a period of initial success in grandiose terms: “Everybody was after me for my formula.” He lost his position “when the market tanked” and relocated to his native state in the southeast “because I was broke.” He lived with his father for a time without finding employment, then returned to his university city an hour away to reconnect with school friends he expected to help him secure employment. However, this did not transpire: “It seemed like everyone was avoiding me.” Unable to support himself independently, he moved to the garage apartment on an aunt’s property. He failed to find employment over many months and lived off of loans from his father and permissiveness of his aunt. He lacked the finances to socialize. This began a period of over a year of being consumed with video games and assuming a reverse sleep-wake cycle: “I’d game all night and sleep during the day when I should have been finding a job.” He reports never having had a sustained romantic relationship. Because his computer activity is primarily gaming, he was administered the IAT-M *as if* the questions were addressing gaming. His score of 68 is moderately impaired. Intra-item scores endorsed as *always* were (2) how often do you neglect household chores because of *gaming*, (7) how often do you check e-mail before something else you need to do, (15) how often do you lose sleep due to late night *gaming*, (16) how often do you find yourself saying ‘just a few more minutes’ when *gaming*, (17) how often do you try to cut down the amount of time spent *gaming* and fail, and (20) how often do you feel depressed, moody or nervous when *not gaming*, which goes away once you are *gaming*. The experience of being consumed with gaming was ego-dystonic. He has since secured full-time employment below his educational and intellectual levels but the new demands of time and schedule have largely derailed his gaming addiction. He has never relied on psychotropics nor abused recreational substances.

#### Case 4

A 52 year old Caucasian male with a history of sub-optimal psychosocial function. An only child of working class parents, the developmental course was reportedly normal. He had some limited college education before pursuing a career in visual media and moving to New York City. He describes a lengthy personal history of heterosexual involvements predicated largely on sexual activity. At age forty he became involved with an Asian national and they moved in together. When she demanded they marry to enhance her legal status he complied. Although within a year she rejected him sexually—“she wouldn’t even let me touch her”—he remained with her for another 6 years. The woman left him when her financial status improved. He found housing in a cramped apartment owned by another man often elsewhere on business. Thereafter he began a 5 year period of being on-line the majority of his wake cycle, which became much more nocturnal than in the past. He was consumed with real time video streams with much younger women in third world countries who would act out his erotic fantasies for a fee. He simultaneously developed a cell phone sex network here and abroad wherein woman would purport to come to orgasm while he spoke to them (his preferred moniker being “Daddy”). As a result of being consumed with these activities he regressed financially and became increasingly isolated: “I was spending so much of my time on-line and on calls that I was letting my work life go, and then I couldn’t afford to go out in the city.” A loyal professional associate found him a discount on a Mac computer to help him assist in editing film. At about this time the screen of his old PC “burned out and I couldn’t afford a new one.” He became motivated to use the new computer for additional similar work assignments that became consuming, while at the same time becoming close friends with a man who “has been good for me because he has a car and wants to go out a lot.” Thus in the last 2 months his work and social life has become much more normalized and he feels his “addiction” is largely in arrest, although he is concerned he could regress. He always felt that his life being dominated by the electronic sexual activities was ego-dystonic. He does not report withdrawal symptoms after over 2 months of largely refraining (a few times a week he makes calls) and has never been on psychotropics. He is not a substance abuser. The IAT-M was administered while he was in the second to last month of his addictive behavior. The score of 65 was moderately impaired and may suggest under-endorsement. Intra-item scores endorsed as *always* were (1) how often do you find you stay on-line longer than you intended, (12) how often do you feel that life without the Internet would be boring, empty and joyless, and (16) how often do you find yourself saying ‘just a few more minutes’ when on-line.

#### Discussion

The majority of the world population is now engaged daily with electronic media and the development of DSM-5 is in its final phases. Therefore more cohesive progress must be made regarding clinical understandings of the vast issue of Pathological Use of Electronic Media (PUEM). These cases provide timely insight into the aging debate over whether PUEM is an independent syndrome or an electronic-enabled expression of a pre-existing disorder. It is evident in all four cases that they can be accounted for in the latter regard. These case evaluations and the literature review bring several matters into focus.

The first understanding from this investigation is the necessity of undertaking a face-to-face interview. As already noted, it has ultimately been a counter-productive irony to rely on large-scale internet surveys in order to ascertain the electronic-addicted user. Both

clinical common sense and the inherent psychometric weaknesses in the most widely used instrument for evaluating internet abuse argue on behalf of the more standardized evaluation approach first undertaken by Shapira [5]. As delineated in the narratives, the current cases would all have resulted in gross under-reporting of history and symptoms without modifying the IAT for application within an interview.

A second broad concern clarified herein is the need to proceed with the more encompassing outlook described by Pies [7]. After a dozen years, the vast majority of studies and the several established psychometric instruments have addressed the internet as the sole source of abuse. Given the proliferation of electronic gadgetry in the twenty first century, this is akin to restricting investigations of psychosis to schizophrenia. Cell phones are by far the most widely used electronic medium, and off-line gaming is the preferred indulgence of younger populations. Indeed, it was only the modification of the IAT as a *gaming addiction test* that made the understandings of case 3 possible. Surely an instrument designed to assess gaming abuse/addiction needs to be developed. Moreover, as texting continues to supplant voice-messaging as the preferred medium of prompt communication, a more complex neurobehavioral ensemble is engaged, and substrates of the compulsive-impulsive spectrum activated. Thus there is a concurrent need for a means to assess texting abuse/addiction. Indeed, the most heuristic means for proceeding psychometrically is the development of an entire electronic abuse test battery. Within a battery, sub-areas of abuse could be weighted within an overall profile.

These cases also reflect on the core debate of diagnostic nomenclature. Arguing against PUEM as yet established as a discrete diagnosis, Pies states: “(PUEM) remains a label for a syndrome that most likely represents numerous etiological pathways and diverse clinical manifestations” and “PUEM should be added to the DSM-5 appendix as a ‘condition for further study’” [7]. These diverse cases affirm this perspective.

Case 1 presents with a dysthymic disorder, episodic poly-substance abuse requiring a recent hospitalization, chronic psychosocial distress within a dysfunctional marriage, and gross educational and occupational underachievement. His consuming on-line activity is clearly a means to both fill the void of an empty life while also escaping its pain. Case 2 suffers from a schizotypal disorder and otherwise mirrors the past and present problems in living of case 1 excepting the marital status. His compulsive on-line and gaming activity serves the same function of filling the waking hours of a meaningless life and otherwise escaping the effort to create one. Case 3 suggests a Mixed Personality Disorder with prominent narcissistic and histrionic features. His educational and occupational attainment has greatly exceeded cases 1 and 2, however at age 30 he has been unable either to sustain optimal function or form an enduring romantic relationship. His pattern of compulsive video-gaming serves to consume his time and energies during prolonged periods of unemployment and as a distraction from social ineptitude. When re-employed, his compulsion subsides to a very significant extent, although not entirely. He suggests that he recently purchased a new game and is spending most of his free hours on it. Case 4 also presents with Mixed Personality Disorder. His descent into a life dominated by on-line sexual compulsion was provoked by a marital abandonment in mid-life. This persisted for 5 years. Like case 3 however, he has both an educational attainment and occupational skill set to fall back on, and when circumstances facilitated the reactivation of his professional life, his on-line activity was substantially supplanted although not entirely eliminated, for most of his empty hours continue to be used for on-line sexual activity.

These cases also reflect the literature—largely Chinese and with high school and university-aged subjects—on personality characteristics of electronic-addicted persons. Shyness, social phobia, depression, substance abuse, hostility, *neuroticism*, impulsivity,

anxiety, low-esteem, dissociative disorder and personality syndromes have been reported in electronic-addicted subjects [4, 11–18, 20]. Again, with one exception those studies were all conducted without face-to-face interviews. The present cases—undertaken through a structured interview and encompassing an exceptionally wide age range—affirm the view that PUEM is an expression of a pre-existing primary disorder, and is on the compulsive–impulsive spectrum. They further suggest that the syndrome is manifest in proportion to the lack of competing adaptive behaviors, is ego-syntonic in relation to the degree of pervasive mental illness and maladjustment, will recur in proportion to lack of alternate demands on the patient’s time, and cannot alleviate without treatment. A combination of medications and behavioral methods established for impulse control disorders would appear to be the intervention for PUEM. Of final note is that a prominent component of the symptom complex in all of the cases is the lapsing into an entirely nocturnal sleep-wake cycle. As a reflection of both the psychosocial and neuroendocrine implications of the syndrome, this aspect of the disorder will likely prove to be a critical focus of treatment.

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## References

1. Young KS: Internet addiction. *The American Behavioral Scientist* 48:402–415, 2004
2. <https://cia.gov/library/publications/the-world-factbook/>.
3. Block JJ: Issues for DSM-V: Internet addiction. *American Journal of Psychiatry* 165:306–307, 2008
4. Shapira NA: Problematic internet use: Proposed classification and diagnostic criteria. *Depression and Anxiety* 17:207–216, 2003.
5. Shapira NA, Goldsmith TD, Keck PE, et al.: Psychiatric features of individuals with problematic internet use. *Journal of Affective Disorders* 57(1–3):267–272, 2000
6. Morahan-Martin J: Internet abuse. *Social Science Computer Review* 23:39–48, 2005
7. Pies R: Should DSM-V designate internet addiction a mental disorder? *Psychiatry* 6:31–37, 2009
8. Grohol, J: <http://psychcentral/netaddiction/>
9. Grohol J: <http://psychcentral.com/blog/archives/2005/04/16/internet-addiction-disorder>
10. Chak K, Leung L: Shyness and locus of control as predictors of internet addiction and internet use. *Cyberpsychology & Behavior* 7:559–570, 2004
11. Ko CH, Yen JU, Chen CC, et al.: Tridimensional personality of adolescents with internet addiction and substance use experience. *Canadian Journal of Psychiatry* 51:887–894, 2006
12. Yen J, Yen C, et al.: Co-morbid symptoms of internet addiction: Attention deficit with hyperactivity, depression, social phobia and hostility. *Journal of Adolescent Health* 41:93–98, 2007
13. Cao F, Su L: Internet addiction among Chinese adolescents: Prevalence and psychological features. *Child Care Health* 33:275–281, 2007
14. Hardie E, Tee MY: Excessive internet use: The role of personality, loneliness and social support networks. *Australian Journal of Emerging Technologies and Society* 5:34–47, 2007
15. Cao F, Sua L, et al.: The relationship between impulsivity and internet addiction in a sample of Chinese adolescents. *European Psychiatry* 22:466–471, 2007
16. Kim HK, Davis K: Toward a comprehensive theory of problematic internet use: Evaluating self-esteem, anxiety, flow, and the self-rated importance of internet activities. *Computers in Human Behavior* 25:490–500, 2009
17. Silvia B, Pallanti S: Internet addiction: A descriptive clinical study focusing on co-morbid and dissociative symptoms. *Comprehensive Psychiatry* 50:510–516, 2009
18. Anolli L, Villani D, Riva G: Personality of people using chat: An on-line research. *Cyberpsychology & Behavior* 8:89–95, 2005

19. International Telecommunications Union: <http://www.itu.int/ITU-D/ict/statistics>
20. Davis JL: Internet addiction: Ruining lives? <http://www.webmd.com/baby/news/20030807/internet-addiction-ruining-lives>
21. Lee YS, Han DH, Yang KC, et al.: Depression like characteristics of 5HTTLPR polymorphism and temperament in excessive internet users. *Journal of Affective Disorders* 109:165–169, 2008
22. Yua H, Zhaoa X, Lia N, et al.: Effect of excessive internet use on the time-frequency characteristic of EEG. *Progress in Natural Science* 19:1383–1387, 2009
23. Ko CH, Liu GC, Hsiao S, et al.: Brain activities associated with gaming urge of on-line gaming addiction. *Journal of Psychiatric Research* 43:739–747, 2009
24. Widyanto L, McMurrin M: The psychometric properties of the internet addiction test. *Cyberpsychology & Behavior* 7:443–450, 2004

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