CASE REPORT

THE COGNITIVE PROFILE AND DIFFERENT PRESENTATIONS OF INTERNET ADDICTION IN TEENAGERS: TWO CASE REPORTS

Gabriel Coutinho, Paulo Mattos, Flávia Miele, Manuela Borges

Abstract

Internet Addiction is commonly comorbid with psychiatric conditions. Some neuropsychological studies have shown that many people with Internet Addiction are significantly impulsive; others suggest that Internet Addiction co-occurs with academic impairment. However, Internet Addiction may also occur in individuals with a wide range of other cognitive and psychiatric profiles. We present neuropsychological and clinical evaluations of two teenagers with Internet Addictions: 1) an adolescent with a normal cognitive profile but a pervasive developmental disorder and a preference for virtual life and 2) a young adult with motor and cognitive impulsivity issues combined with alcoholism and attention-deficit-hyperactivity disorder symptomatologies. The case studies had distinct cognitive and psychiatric profiles from one another, although both showed significant academic impairments—even the adolescent with cognitive functioning integrity. The psychiatric and cognitive features of both participants and their relationship to outcomes are discussed.

Key Words: Internet Addiction, problematic Internet use, Internet dependence, Internet abuse, academic impairment, neuropsychology

Declaration of interest: Dr. Paulo Mattos is consultant with and Speaker's Bureau with Novartis Janssen-Cilag and Shire; receives grant funding with Shire and Novartis.

Gabriel Coutinho[1,2,3], Paulo Mattos[1,2,3], Flávia Miele[2], Manuela Borges[2,3]
1 - Instituto de Psiquiatria da Universidade Federal do Rio de Janeiro (IPUB)
2 - Centro de Neuropsicologia Aplicada (CNA)
3 - Neuropsychology Integrated Laboratories (LINEU – UFMG-USP-UFRJ-UFBA).

Corresponding author
Gabriel Coutinho
Rua Paulo Barreto, 91, Botafogo, Rio de Janeiro, RJ, Brazil.
Zip code: 22280-010
gabrielccoutinho@gmail.com

Introduction

Internet Addiction (IA) is a new condition not yet found in diagnostic manuals of mental disorders; however, IA seems to be a common disorder, and some authors (e.g., Block 2008) have suggested that it should be included in the DSM-V. Young (1998) proposed that IA diagnostic criteria should be based on studies of substance dependence (SD) and pathological gambling (PG), which are characterized by an inability to control or abstain from Internet use. Like other dependence pathologies, most people with IA progress toward a loss of control regarding Internet use. People with IA often face higher levels of satisfaction and pleasure when online, and some disassociate from the "real world".

Previous studies have shown that certain psychiatric features might be risk factors for developing IA; in fact, up to 86% of IA cases presented at least one DSM-IV diagnosis in a North Korean study (Ahn 2007). Ni et al. (2009) found that freshman college students with IA showed significantly more psychiatric problems compared to students without IA. More in detail, in such study a wider number of students with IA suffered from major depression (Ko et al. 2008, Yeh et al. 2008). However, further disorders such as social anxiety disorders could be associated to IA as well (Caplan 2007). Loneliness, which is common among people with social anxiety disorder or pervasive developmental disorder (PDD), is also a risk factor for IA. Moreover, a recent study demonstrated that people with psychological dependence on massive multiplayer online games (MMOGs) usually valued offline social relationships less than those without this dependence (Ng and Wiemer-Hastings 2005). Academic impairment is commonly found among people with IA, probably because they do not sleep well and often miss class (Kubey et al. 2001).

People with IA may suffer from neuropsychological dysfunction; for example, impulsivity is associated with IA (Cao et al. 2007). It is well known that IA diagnostic criteria are derived from pathological gambling (PG; Abreu et al. 2008) and that IA is frequently comorbid with attention deficit hyperactivity disorder (ADHD; Ha et al. 2006). Both ADHD and PG present with cognitive and motor impulsivity (Malloy-Diniz et al, 2007a, Fuentes et al. 2006), and both

Submitted July 2010, Accepted October 2010

diagnoses are linked to a diminished ability to consider future consequences—just as in people who have substance dependences (Bechara and Damasio 2002). This pattern of impaired decision-making (i.e., cognitive impulsivity) is associated with abnormal functioning of the orbitofrontal cortex (Bechara et al. 2000).

However, IA is not necessarily associated with a specific cognitive profile. Davis (2001) proposed that maladaptive cognitions are one possible explanation for pathological Internet use; these cognitions account for the cognitive distortions that some Internet users have regarding their self and world. People with IA may favor an online life over reality (see Case 1). In addition, Caplan (2003) proposed that preferences for online social interactions not only imply cognitive distortions, but also cognitive preferences that occur in participants who believe that they perform better (and, consequently, feel better) in online interactions when compared with offline social interactions. Grouping these two constructs, Liu and Peng (2009) suggested that preference for a virtual life (PVL) is "*one's cognitions or beliefs that one will perform better, feel better about oneself, and perceive better treatment from others in an online virtual gaming world compared to real life*". Despite the reference to an "online virtual gaming world", PVL might be easily applied to all people who prefer virtual lives to the real world.

Given the need to better understand and describe people with IA, this paper presents two different case studies of youths with problematic Internet use. The first is a youth with PDD and marked social deficit, albeit without other cognitive deficits. The second is a person with normal social abilities, but who presents a clinical and neuropsychological pattern of motor and cognitive impulsivity.

Case 1

A psychologist referred DR, a right-handed, male, 16-year-old high school student, to investigate the presence of ADHD or PDD. DR's main symptom was his lack of academic interest. His parents reported that he has few friends; furthermore, his father said that his relationships are mainly in a virtual world, preventing his parents from observing his actions. DR had good performance in all tests and engaged in formal discourse. Most of his answers during interview sessions were related to Internet or videogames.

We conducted separate semi-structured interviews with DR as well as his parents, which showed that DR presents failure to develop relationships with peers, unwillingness to share contentment, specific interest (manga and anime) and formality of discourse. These symptoms suggest a PDD not otherwise specified (NOS) diagnosis. The reports did not suggest that DR had significant ADHD symptoms. His own report, grouped with his parents' report, indicated that he spends 12 or more hours per day surfing the Internet. This use jeopardizes his school performance because it reduces his time to do homework and study for tests. Additionally, his class attention was impaired because he only sleeps a few hours each night. He maintains relationships using Skype; however, these relationships do not include real-life school friends. Upon direct questioning, he admitted he had no real friends, to having impaired social ability, and to suffering from a lack of respect by his peers at school. His discourse is overly formal, employing uncommon words for adolescents. He has never had a girlfriend and he also reported feeling no attraction to real people; conversely, he did feel attracted toward Internet characters. He stated, "I am not attracted to real people; I am attracted to anime and manga" and "I am in love with a fictitious character". When his parents prohibited him from accessing the Internet because of his low academic performance, he told them, "I feel like I lost a limb". He asserts that his "real day" begins after school on the Internet, suggesting a PVL. The reports of maladaptive preoccupation with Internet use, the need to increase the amount of time online to achieve satisfaction, feelings of restlessness and depression when attempting to diminish the use of Internet, staying online longer than planned and lying to family members regarding the amount of time spent online all suggest an IA diagnosis (Young 1998).

Neuropsychological assessment results. The WAIS-III (Wechsler Adult Intelligence Scale, 3rd Edition) revealed that DR's global IQ was 127. The results did not indicate significant discrepancies between verbal and performance abilities (verbal IQ=124; performance IQ=124). DR's performance on the CPT-II (Continuous Performance Test) was normal and did not reveal sustained attention or motor inhibitory control deficits. In addition, DR was attentive for the different informal evaluation sessions. Digit span (WAIS-III; a measure of verbal working memory) was within age and developmental expectations for both forward and backward series. DR's expressive and receptive language was normal. Furthermore, his verbal memory performance on the RAVLT (Malloy-Diniz et al. 2007b) was normal for acquisition and retention over time. His visual memory was within normal ranges using the Rey Complex Figure Test, which suggests that he does not have learning strategy deficits for either verbal or visual material. The Brazilian version of the Iowa Gambling Task (IGT; a test developed to evaluate decision-making ability; Malloy-Diniz et al. 2008) indicated that DR has no cognitive impulsivity. **Tables 1** and **2** and **figure 1** describe these results.

Case 2

A psychologist referred MN, 19-year-old male, to investigate his academic impairment. He was adopted as a newborn. There is no information regarding his mother's pregnancy. He met developmental checkpoints, but began to have difficulty in school by the first grade. Multiple professionals, including psychologists, psychiatrists (who prescribed methylphenidate and antidepressants) and speech therapists, treated MN. All treatments were considered ineffective. He failed sixth grade twice and seventh grade once. His mother's report suggests that MN lacks both academic and non-academic persistence and gives up on projects even when expressing great desire (e.g., getting a driving license). He also presented planning deficits evidenced by a failure to take into account past

Table 1. *Performance on tests of WAIS-III battery*

	Case 1		Case 2	
Test / Index	**IQ index**	**Classification**	**IQ index**	**Classification**
Full scale IQ	127	Superior	95	Average
Verbal scale IQ	124	Superior	94	Average
Performance IQ	124	Superior	97	Average
Verbal comprehension	129	Superior	94	Average
Perceptual organization	123	Superior	105	Average
Processing speed	96	Average	91	Average
	Percentile		**Percentile**	
Vocabulary	75	High-average	50	Average
Similarities	98	Very-superior	9	Low-average
Arithmetic	98	Very-superior	50	Average
Digit Span	25	Average	37	Average
Information	99	Very-superior	63	Average
Picture completion	63	Average	25	Average
Coding	50	Average	16	Low-average
Block Design	99	Very-superior	63	Average
Matrix Reasoning	84	High-average	91	Superior
Picture Arrangement	98	Very-superior	25	Average
Symbol Search	37	Average	50	Average

Vocabulary: expressive language; **Similarities**: verbal abstract reasoning; **Arithmetic**: mathematic skills; **Digit Span**: verbal working memory; **Information**: general knowledge; **Comprehension**: receptive language; **Picture completion**: visual perceptual skill; **Coding**: visual-motor dexterity; **Block design**: visual-constructional skills; **Matrix reasoning:** abstract reasoning; **Picture Arrangement**: logical sequential reasoning; **Symbol search**: visual-motor dexterity and processing speed

Figure 1. *Description of card selection (advantageous/disadvantageous) for each block of 20 choices (Iowa Gambling Task)*

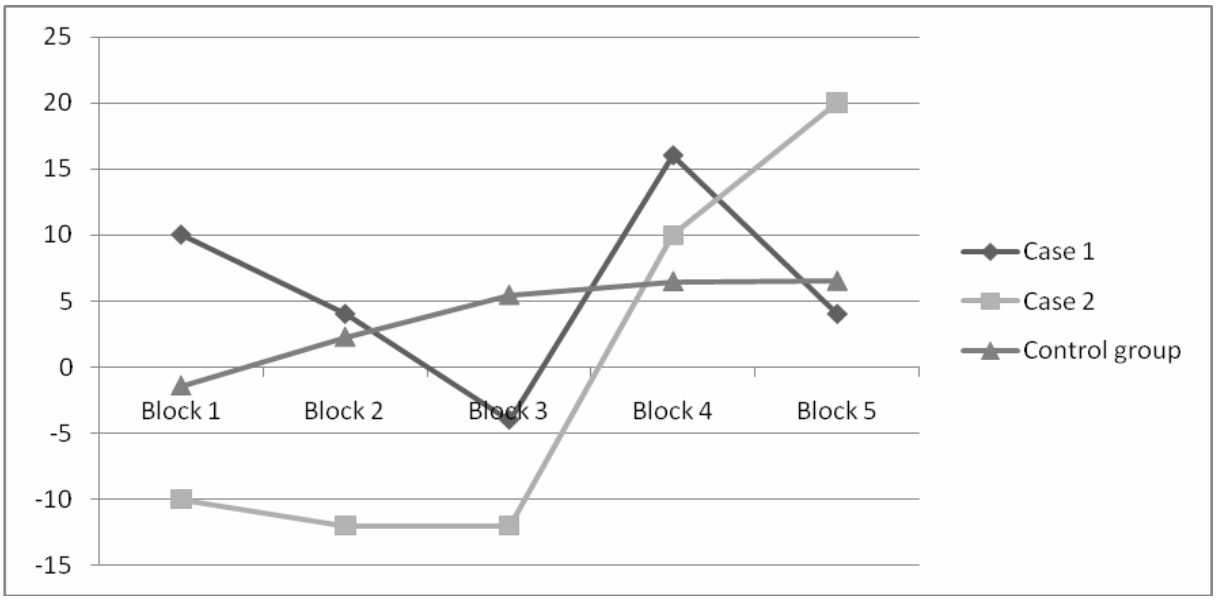

Table 2. *Performance on memory, executive functions, language, and attention tests*

	Case 1 - DR		Case 2 - MN	
Test	**Score**	**Classification**	**Score**	**Classification**
Digit Span				
• Span forward	6	Normal	6	Normal
• Span Backward	6		5	
Rey's complex figure				
• Copy	36	Normal	36	Normal
• Retrieval	30	Normal	23	Normal
RAVLT				
• A1	8	Normal	5	Impaired
• A5	15	Normal	11	Normal
• Proactive interference	0,62	Impaired	0,8	Normal
• Retroactive interference	1	Normal	1	Normal
• Forgettting speed	1	Normal	0,9	Normal
• Recognition memory	15	Normal	15	Normal
Word fluency – phonological				
• F	15	Normal	10	Impaired
• A	15	Normal	9	Impaired
• S	18	Normal	12	Impaired
Word fluency – semantics				
• Animals	23	Normal	16	Normal
• Fruits	13	Impaired	11	Impaired
CPT-II Omissions	2	Normal	3	Normal
CPT-II Commissions	25	Normal	31	Impaired
CPT-II Hit RT	303,72	Normal	282,22	Normal
CPT-II Hit RT Std. Error	4,86	Normal	4,56	Normal
CPT-II Variability	9,50	Normal	8,78	Normal
Detectability (d´)	0,23	Normal	-0,09	Impaired
CPT-II RT ISI Change	0,00	Normal	0,02	Normal
CPT-II SE ISI Change	0,18	Normal	0,07	Normal
Iowa Gambling Task				
• Net score	30	Normal	-4	Impaired*
Token test	43	Normal	40	Normal

Digit Span: verbal working memory; **Stroop**: attention and inhibitory control; **Rey's complex figure**: constructional praxia and visual memory; **RAVLT**: verbal memory; **Word fluency**: verbal fluency; CPT-II: sustained attention and inhibitory control; **Iowa Gambling Task**: decision-making; **Token test**: receptive language

* Despite having a normal score, we considered this performance impaired because the participant's pattern of choice was impaired until Deck B (a disadvantageous choice) was over (due to excessive choices). Subsequently, the participant's performance improved because this deck was no longer a valid option (see **figure 1**).

experiences: Despite having multiple failures at school, he "was planning to do three school grades in only two months in an intensive school".

MN is an impulsive young man who only likes using the Internet or playing videogames. He is a compulsive gamer and gambler. His mother reports that he has some difficulties interacting with peers, and his usual relationships are with other compulsive gamblers. In addition, MN abuses alcohol. He frequently plays MMOGs. His behavior across interview sessions was normal, despite two sessions in which he tried to use his mobile phone to access the Internet when he thought the examiner was not aware of his behavior. Furthermore, he presented symptoms of impulsivity: an inability to wait for the examiner to finish instructions without interrupting. MN says that he started playing videogames compulsively when he was 9 years old. He claims that his failure to pass the sixth grade was due to the "abuse" of Internet games. He says he spent all night long playing games.

Neuropsychological assessment results: The WAIS-III (Wechsler Adult Intelligence Scale, 3rd Edition) revealed that MN's global IQ was within normal ranges (IQ=95). The results did not indicate significant discrepancies between verbal and performance abilities (verbal IQ=94; performance IQ=97). MN's performance on the CPT-II (Continuous Performance Test) was below normal, with a high variability in reaction time across the test. In addition, the CPT-II revealed a high number of commission errors suggestive of significant motor impulsivity. His performance on the IGT was also impaired, suggesting cognitive impulsivity, which may be associated with myopia for the future—a pattern of decision-making based only on the present, regardless of future consequences. This type of thinking is often associated with addiction. His verbal memory performance on the RAVLT (Malloy-Diniz et al. 2007b) was normal for acquisition (normal learning slope) and retention over time. MN's visual memory was normal on the Rey Complex Figure Test, which suggests that he does not have a learning strategy deficit for either verbal or visual material. An expressive language evaluation revealed that MN's verbal fluency was somewhat below age and developmental expectations. His receptive language was normal.

A psychiatric assessment revealed symptoms of inattention and hyperactivity-impulsivity; however, MN did not present enough symptoms to meet DSM-IV criteria for this diagnosis; alternatively, he did fulfill the criteria for alcohol abuse. Multiple reports of a maladaptive preoccupation with Internet use, the need to increase the amount of time online to achieve satisfaction, feelings of restless and depression when attempting to diminish Internet use and staying online longer than planned suggests an Internet dependence diagnosis.

Discussion

Block (2008) proposed that IA is divided into at least three subtypes: excessive gaming, sexual preoccupations, and e-mail/text messaging. Case 2 presents an excessive gaming pattern of Internet use, although MN also used the Internet for other aims. Notably, MN did not report compulsions for real-life games (or gambling) and had an earlier onset of compulsive behavior than typically seen in compulsive gamblers. Case 1 did not present a specific pattern of Internet use; DR divided his Internet use between Skype—possibly due to his interpersonal difficulties—and Japanese cartoons (manga and anime). In Case 1, the IA was comorbid with PDD-NOS, which partially explains DR's maladaptive use of Internet. In Case 2, an impulse control disorder was a significant factor that contributed to IA. Both cases are in accordance with the theory that IA is likely a compulsive-impulsive disorder (Block, 2008). DR showed specific interest, a repetitive pattern of behavior (i.e., compulsion). Alternatively, MN showed a neuropsychological profile of cognitive and motor impulsivity comorbid with alcohol abuse, which is also commonly marked by impulsivity.

Case 1 highlights the relationship between poor social skills and PVL. Caplan (2003) previously demonstrated this association by suggesting that people with social anxiety or loneliness are prone to develop preferences for technology. For this reason, PDD may be a risk factor for developing PVL, given that bullies often victimize people who have an inadequate social life. Social anxiety and loneliness can progress into cognitive distortions regarding the self and the world, allowing a person to feel "in love" with a virtual character or feel as if one has "lost a limb" when unable to connect to the Internet. The pattern presented in Case 1 did not match a specific cognitive profile because DR's neuropsychological performance was normal. The lack of social relationships may be more important to IA development than PVL because virtual life could be perceived as a friendlier environment than the real world.

On the other hand, Case 2 had a normal social life but with some problems related to his academic performance and with alcohol abuse. In addition, despite not having a full ADHD diagnosis, his report suggests the presence of both inattention and hyperactivity-impulsivity. MN has IA and spent most of his time on the Internet due to MMOGs. The literature shows several people with IA that also have a cognitive profile characterized by impulsivity (Cao et al. 2007, Treuer et al. 2001), suggesting that IA is an impulse control disorder. Moreover, those authors suggest that people with IA express a mixture of obsessive-like features related to their Internet use. Alcoholics are prone to cognitive impulsivity, even when they are abstemious (Salgado et al. 2009). People with ADHD also have a higher chance of having problems with Internet use, as demonstrated by studies that have found high comorbidity rates between IA and ADHD (e.g., Ha et al. 2006). The link between IA and impulsivity has also been demonstrated in a study showing that individuals with IA performed significantly worse on tests that demand inhibition control compared to people without IA (Cao et al. 2007). MN's performance on both motor (CPT-II) and cognitive impulsivity (IGT) tasks was significantly impaired. This performance is somewhat expected given his history of alcohol abuse, IA and ADHD symptoms. People with this type of performance often have difficulties anticipating the consequences of their actions (e.g., thinking about the consequences

of binge drinking) or inhibiting behaviors that might lead them to negative consequences.

In summary, although both cases had IA diagnoses, the cognitive profiles and general patterns of everyday impairments were significantly different. Case 1 (DR) presented with a normal cognitive profile but had impaired social interaction; moreover, he was diagnosed with PDD NOS. DR showed a clear pattern of PVL that might be due to his social inabilities as well as the bullying he suffered at school. These circumstances might explain (at least partially) the IA diagnosis. Case 2 (MN) presented with inhibitory control difficulties as well as motor and cognitive impulsivity. MN was diagnosed with alcohol addiction and ADHD, disorders that are both associated with impulsivity. Both DR and MN had school-related impairments, even when there was no cognitive deficit (i.e., DR). We hypothesize that the academic impairment shared by both participants is at least partially associated with IA (Kubey et al. 2001).

We should consider that, being a case report paper, the results presented above are limited by a lack of a sufficiently high number and of statistical approaches. Future studies with large samples and adequate methods should address different aspects of neuropsychological and clinical profile of IA in order to better investigate the issues discussed above.

References

Abreu CN, Karam RG, Gòes DS, Spritzer DT (2008). Internet and videogame addiction: a veview. *Revista Brasileira de Psiquiatria* 3, 2, 156-167.

Ahn DH (2007). Korean policy on treatment and rehabilitation for adolescent's Internet addiction, in 2007 International Symposium on the counseling and treatment of youth Internet addiction. *National Youth Commission* 49, Seoul, Korea.

Bechara A, Damasio H, Damasio AR (2000). Emotion, decision making and the orbitofrontal cortex. *Cerebral Cortex* 10, 295-307.

Bechara A, Damasio H (2002). Decision-making and addiction (part II): myopia for the future or hypersensitivity to reward? *Neuropsychologia* 40, 10, 1690-1705.

Block JJ (2008). Issues for DSM-V: Internet addiction. *American Journal of Psychiatry*, 165, 3, 306-307.

Cao F, Su L, Liu T, Gao X (2007). The relationship between impulsivity and Internet addiction in a sample of Chinese adolescents. *European Psychiatry* 22, 466-471.

Caplan SE (2003). Preference for online social interaction: A theory of problematic Internet use and psychological well-being. *Communication Research* 30, 625-648.

Caplan SE (2007). Relations among loneliness, social anxiety, and problematic Internet use. *CyberPsychology & Behavior* 10, 234-242.

Davis RA (2001). A cognitive-behavioral model of pathological Internet use. *Computers in Human Behavior* 17, 187-195.

Fuentes D, Tavares H, Artes R, Gorenstein C (2006). Self-reported and neuropsychological measures of impulsivity in pathological gambling. *Journal of the International Neuropsychological Society* 12, 6, 907-912.

Ha JH, Yoo HJ, Cho IH, Chin B, Shin D, Kim JH (2006). Psychiatric comorbidity assessed in Korean children and adolescents who screen positive for Internet addiction. *Journal of Clinical Psychiatry* 67, 5, 821-826.

Ko CH, Yen JY, Chen CS (2008). Psychiatric comorbidity of Internet addiction in college students: an interview study. *CNS Spectrums* 13, 147-54.

Kubey RW, Lavin MJ, Barrows JR (2001). Internet use and collegiate academic performance decrements: Early findings. *Journal of communication* 51, 2, 366-382.

Liu M, Peng W (2009). Cognitive and psychological predictors of the negative outcomes associated with playing MMOGs (massively multiplayer online games). *Computers in Human Behavior* 25, 1306-1311.

Malloy-Diniz L, Fuentes D, Borges Leite W, Correa W, Bechara A (2007a). Impulsive behavior in adults with attention deficit/hyperactivity disorder: Characterization of attentional, motor and cognitive impulsiveness. *Journal of the International Neuropsychological Society* 13, 693-698.

Malloy-Diniz LF, Lasmar VA, Gazinelli LS, Fuentes D, Salgado JV (2007b). The Rey Auditory-Verbal Learning Test: applicability for the Brazilian elderly population. *Revista Brasileira de Psiquiatria* 29, 4, 324-329.

Malloy-Diniz L, Leite W, de Moraes PH, Correa H, Bechara A, Fuentes D (2008). Brazilian portuguese version of the Iowa Gambling Task: transcultural adaptation and discriminant validity. *Revista Brasileira de Psiquiatria* 30, 2, 144-148.

Ng BD, Wiemer-Hastings P (2005). Addiction on the Internet and online gaming. *CyberPsychology & Behavior* 8, 110-113.

Ni X, Yan H, Chen S, Liu Z (2009). Factors influencing Internet Addiction in a sample of freshman university students in China. *CyberPsychology & Behavior* 12, 3, 327-330.

Salgado JV, Malloy-Diniz LF, Campos VR, Abrantes SSC, Fuentes D, Bechara A, Correa H (2009). Neuropsychological assessment of impulsive behavior in abstinent alcohol-dependent subjects. *Revista Brasileira de Psiquiatria* 31, 1, 4-9.

Treuer T, Fábián Z, Füredi J (2001). Internet addiction associated with features of impulse control disorder: is it a real psychiatric disorder? *Journal of Affective Disorders* 66, 283.

Yeh YC, KO HC, Wu JY (2008). Gender differences in relationships of actual and virtual social support to Internet addiction mediated through depressive symptoms among college students in Taiwan. *CyberPsychology & Behavior* 11, 485-487.

Young KS (1998). Internet addiction: the emergence of a new clinical disorder. *CyberPsychology & Behavior* 1, 3, 237-244.