Internet Addiction and its Correlates

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Abstract

Internet Addiction (IA) was first recognized in 1996, by Kimberly Young, Ph.D. who realized that Internet users were becoming addicted to the Internet similarly to how others became addicted to drugs and gambling. More recent research quantified the prevalence of IA in the U.S., ranging from 0.3% to 8%, and identified numerous comorbid psychiatric symptoms and behavioral changes including anxiety, attention deficit, and social avoidance. For this study, a 32 item IA assessment and a 35 item psychiatric symptom assessment was developed using Young's (1996) diagnostic criteria and the Diagnostic and Statistical Manual of Mental Disorders version 5 (DSM-5), respectively. The assessments were administered to 1491 participants via an online data collection platform. The current prevalence rate of IA and comorbid psychiatric symptoms amongst frequent Internet users was identified. 35 percent of the sample met the criteria for IA and there were significant correlations between IA severity and symptoms of general anxiety, binge eating, social anxiety, depression, attention deficit, and disruptive mood. The results support previous research identifying comorbid psychiatric symptoms and suggest IA rates are increasing in the U.S. Further, IA should be added to the next revision of the DSM and be treated as a public health concern due to its increasing prevalence and co-morbid psychiatric symptoms.

Internet Addictions and its Correlates

During the Cold War, in 1969, the United States Defense Department's Advanced Research Project Agency established a connection between two computers 350 miles apart (Keefer and Baiget, 2001). This was the first step to a globally interconnected world with nearly instantaneous data sharing, the largest public library of all time, and a source of immediate gratification which led to the beginning of a new behavioral addiction. Internet Addiction (IA), was first recognized almost 30 years later, in 1996, by Kimberly Young, Ph.D. Young realized some users were becoming addicted to the Internet similarly to how others became addicted to drugs and gambling; addiction resulted in eventual academic failure, reduced work performance, and marital discord and separation.

Diagnosing IA is challenging because there is no universally accepted technique. However, there are various components and symptoms of IA which are agreed upon. Interestingly, all identified problematic behaviours and components are extremely similar to those of drug addiction and pathological gambling (Shapira et al. 2003; Young, 1996).

The first diagnostic technique for Internet addiction was developed in 1996 by Kimberly Young. Young defined IA as an impulse-control disorder and modified pre-existing pathological gambling criteria for her original Diagnostic Questionnaire which identified addictive from normal Internet usage. Her eight-item questionnaire examined the following behaviours: preoccupation with the Internet; developed tolerance to the Internet; unsuccessful attempts to mitigate or stop addictive behavior; withdrawal symptoms; excessive amount of time on Internet; jeopardizing significant relationships, jobs, educational, or professional opportunities; lying to family members, therapists or others to conceal the use of the Internet; uses internet to escape

from problems or relieve dysphoric mood. Later studies have simplified or enhanced these original diagnostic techniques.

Chakraborty et al. (2010) defined problematic computer usage as time consuming and/or causing distress, or impairment, in normal life functioning. Further, the authors identified the following four components for diagnosing Internet addiction: Excessive use, causing a loss of a sense of time and neglection of basic drives; withdrawal symptoms when trying to cut back our quit behaviour, and feelings of anger, tension, or depression; tolerance, regarding the constant need for better equipment and software, as well as more time online; and finally, negative repercussions, such as arguments, lying, poor achievement, social isolation, and fatigue. Using these components, Chakraborty et al. (2010) and others have diagnosed IA in studies, and clinically.

Two other notable diagnostic techniques are those of Shapira et al, (2003), and Beard's Diagnosis. Shapira et al, defined IA as uncontrollable, markedly distressing, time consuming, and resulting in social, occupational, or financial difficulties. The authors agreed with Chakraborty et al (2010) and Young, (1996) defining IA as an impulse control disorder similar to OCD. Further, they found the patients displayed similar behaviour to substance abusers. Beard's Diagnosis for IA are those who meet at least five out of the eight behaviours defined originally by Young, (1996).

The reported prevalence rates of IA are extremely variable by study and country. The variability is due to different diagnostic techniques and cultural norms. The lowest prevalence identifies IA at 0.3% in the United States (Aboujaoude et al. 2016) while the highest is at 38% in China (Leung 2004). Studies examining the United States population alone vary dramatically;

Aboujaoude et al., (2013) found IA at 0.3% - 0.7% for the U.S., while Morahan-Martin and Schumacher (2000), found a prevalence rate of 8.1% in the U.S. Two other notable prevalence assessments in the U.S. were conducted by Greenfield (1999) on over 17,000 participants using a 36-item online assessment and Aboujaoude et al. (2006) on over 2,500 using a random-digit-dial telephone survey. The studies estimated a 6% addiction rate and 12.5% suffer from one or more signs of internet addiction, respectively.

Similar to other addictions, IA carries a wide array of serious negative behavioral changes (Ansari, 2017; Cash, 2012). The Internet addict can experience a lost sense of time, urges to use the Internet while offline, guilt or depression, as well as problems at work, school, home, or in relationships. 50% of those suffering from IA have had severe problems with their work or social life (Cash, 2012). Further, employees and students with Internet access at work or school spend considerable amounts of time doing non-work Internet activity. At home, IA causes lack of sleep and untimely eating due to fixation with the Internet (Cash, 2012).Teenagers seem to be affected the most with severe failure to manage time, lack of sleep, untimely eating, and social isolation (Ansari, 2017).

Internet addiction is frequently associated with a variety of mental health issues such as mood and anxiety disorder, substance abuse, depression, and psychoses. Further, 52% of Internet addicts will face lifelong mental symptoms and meet the specifications of at least one of the following mental health disorders: borderline, antisocial or narcissistic disorder (Chakraborty et al, 2010). Other disorders found to be co-morbid with IA are bipolar disorder, intermittent explosive disorder, kleptomania, pathological gambling, and compulsive buying. A notable study examining the frequency of the following disorders amongst Internet addicted patients found:

bipolar disorder - 70%, intermittent explosive disorder - 10%, kleptomania and pathological gambling both - 5%, and compulsive buying - 20% (Shapira et al, 2003). Chakraborty also found that excessive use of the Internet is shown to increase levels of depression, loneliness, hostility, interpersonal sensitivity, psychoticism and social isolation. More studies identified and compiled examining co-morbidities of internet addiction found attention-deficit/ hyperactivity disorder - 14%, hypomania - 7%, generalized anxiety disorder - 15%, social anxiety disorder - 15%, dysthymia - 7%, obsessive compulsive personality disorder - 7%, and avoidant personality disorder - 7% (Chakraborty et al, 2010).

Treating IA can be extremely challenging due to the inability to ask a patient to completely abstain from the Internet. The current global technological society makes Internet usage nearly vital to everyday life-- and in many cases a significant benefactor when used responsibly. Because of this, treatments must find ways to eliminate addictive behaviors while not totally cutting out all usage of the Internet. The three primary treatment modalities studied and used are pharmacological and psychological, as well as multidisciplinary approaches combining the two (Cash et al, 2012; Chakraborty et al, 2010; Shapira et al, 2013; Peukert et al, 2010; Orzack et al, 1999). Of the three treatment categories there are multiple sub-categories; however, a multidisciplinary approach is the most effective (Cash et al, 2012).

Pharmacological approaches utilize various psychotropic medications to treat IA. Prescribing patients with antidepressants, mood stabilizers, opioid receptor agonists, anxiolytics and even ADHD medication have proved rewarding and are the basis of the pharmacological method (Cash et al, 2010; Chakraborty et al, 2010; Shapira et al, 2013). SSRIs, venlafaxine and bupropion in particular, were the antidepressants used thus far in research, and were found

successful in mitigating IA-associated problematic behaviors (Cash et al, 2012; Chakraborty et al, 2010). Lithium, gabapentin, and divalproex were used to stabilize mood and were also found to yield a negative response to IA-associated problematic behavior (Shapira et al, 2013). These antidepressant and mood stabilizing pharmaceuticals were used to treat the co-morbid psychiatric symptoms. Other less researched treatments for the co-morbid symptoms of IA include the use of anxiolytics for patients with an anxiety disorder, methylphenidate for ADHD patients, and naltrexone as an opioid receptor agonist for those with chronic pain (Cash et al, 2012).

The more heavily researched psychological approach relies on clinical therapeutic techniques. Therapy treatments include: family and marital therapy, reality therapy, acceptance and commitment therapy, motivational interviewing therapy, and cognitive behavioral therapy (Peukert et al, 2010). Other treatment options are social support groups and halfway homes. Of all the psychological treatment options, cognitive behavioral therapy (CBT) proved most effective; in numerous studies, patients treated with CBT experienced an improvement in motivation to stop using the internet, ability to control internet use, offline social behavior, ability to abstain from sexually explicit online sites, and achieving sobriety from problematic internet behavior (Cash et al, 2012; Chakraborty et al, 2010; Orzack et al, 1999). Another psychological treatment modality that proved extremely effective is the eight step process created by Young, (1996). Acceptance and commitment therapy is also hypothesized to be effective. In a preliminary study conducted by Twohig and Crosby (2010), utilyzing acceptance and commitment therapy as a treatment for problematic internet pornography viewing, there was 85% reduction in viewing post treatment that was sustined for three months (83% reduction).

While these treatment options are effective, neither psychological nor pharmacological approaches are as efficient as multimodality approaches (Cash et al., 2012).

Combining multiple psychological and pharmacological approaches simultaneously are the basis for the most effective multidisciplinary approach (Cash et al., 2012). For adults, seemingly the most effective treatment is a combination of CBT, psychotropic medication, and family or marital therapy (Cash et al., 2012; Orzack et al., 2006). Whereas for adolescents, effective treatments include regular CBT, parent training, family therapy, and teacher education (Du et al., 2010; Fang-ru & Wei, 2005 as referenced by Cash et al., 2012). Another effective modality combines psychodynamic therapy and CBT (Orzack et al, 1999).

The pathophysiology of IA is hypothesized to be similar to that of other behavioral and substance addictions (Cash et al., 2012; Chakraborty, 2010; Ko et al., 2009; Lu et al., 2017) and a growing body of literature suggests that multiple neurotransmitter systems are associated (Cash et al., 2012; Grant et al., 2010; Lu et al., 2017). Mainly examining the dopamine system, problematic online behaviors stimulate pleasure sites in the brain (Cash et al., 2012). Specifically, Internet use may cause the excessive release of dopamine from ventral tegmental neurons into the nucleus accumbens and orbitofrontal cortex leading to an array of physiological changes (Cash et al., 2012; Grant et al., 2010). Over time, as dopamine receptors are constantly being stimulated, a need for more stimulation is needed to produce the same pleasurable effects--the brain begins to develop a tolerance, downregulating D1 receptors (Cash et al., 2012; Grant et al., 2010; Kim et al., 2011). For an addict, these reward centers are constantly being stimulated, thus, high sensation characteristics are needed to avoid withdrawal symptoms. Once an addiction

is established and tolerance begins to develop, more Internet platforms are needed to pursue increasing psychological rewards and satisfy the user (Cash et al., 2012; Grant et al., 2010)

Consistent with the former theory, Internet gaming addicts produce an increased, ventral and dorsal, striatum activation during exposure to internet gaming cues compared to healthy control subjects (Lu et al., 2017). Further, consistent with findings from substance addiction (Grusser et al., 2004; Vollstadt-Klien et al., 2010 as referenced in Lu et al., 2017), and consistent with other internet addiction studies (Kim et al., 2011), dorsal striatum activation was most pronounced--versus ventral--suggesting a transition from ventral to dorsal striatal activation (Lu et al., 2017).

Method

Participants

1491 participants completed the self-reported IA and psychiatric symptoms assessments. The sample consisted of 597 self-identified females, 878 males, 4 participants self-identified their gender as “non-binary” or “non-binary/fluid,” 1 particpants identified as “agender” and 11 particpants did not identify their gender. 44.67% of the sample was White/Caucasion, 37.99% was Asian/Pacific Islander. The median and mode age brackets were 30-39, and 21-29, respectively. The median and mode of the highest level of education completed by participants was graduated from college.

Measures

The 32 item IA test was the second iteration of the diagnostic assessment developed by the authors for the current research. The first version of the IA test was developed using the diagnostic criteria created by Young, (1996). For the first iteration of the test, five Likert-type

questions per construct were written, each of the constructs coming from one of Young's eight original diagnostic questions: Preoccupation with the internet; Increased use; Unsuccessful attempts to reduce behavior; Psychomotor complaints while attempting to reduce behavior; loss of time while online; negative impact on work, school, or family; Lied to conceal extent of internet use; And using the Internet to relieve dysphoria. This first version was completed by 404 participants and 4 items per construct with the highest item to total score correlation were selected to comprise the current 32 item assessment. The revised assessment captured responses on a slider scale with a numeric range from 0 to 100. The current IA score was calculated by the summation of all answers divided by 32, providing a score of 0 to 100. The test was completed by 1491 participants and proved reliable [N = 1491; Chronbach's Alpha = 0.98; mean = 48.60; median = 62.50; minimum = 0; maximum = 100; SD = 26.06].

The 43 item psychiatric symptom assessment was developed using the diagnostic criteria in the Diagnostic and Statistical Manual of Mental Health Disorders (5th ed.; *DSM-5*; American Psychiatric Association). Six constructs were created to evaluate self-reported presence and severity of psychiatric symptoms in the following domains: general anxiety, binge eating, social anxiety, depression, attention deficit, and disruptive mood. Slider scale questions with a numeric range of 0 to 100 were written by rephrasing the diagnostic criteria in the DSM-5 into questions. Care was taken to uphold the phrasing and terminology used in the DSM-5. For example: The DSM-5 main heading diagnostic criteria for *Major Depressive Disorder,* "Depressed mood most of the day, nearly every day" (DSM-5 pg. 160) was rewritten for the psychiatric symptom assessment as, "I have a depressed mood most days, nearly everyday." To score the assessment,

main heading diagnostic criteria in the DSM-5 were weighted more heavily than sub heading diagnostic criteria and a score 0 to 100 was provided for each condition.

Procedure

The procedure consisted of the 32 item self-reported IA assessment and 43 item psychiatric condition assessment administered to participants via Amazon Mechanical Turk (Amazon; Seattle, washington, USA; www.mturk.com) Each participant was paid $0.5 for thorough and honest completion of the assessment. All data was collected electronically and within 24 hours.

Data Analysis

The data were analyzed using SPSS (Version 26.0; IBM, Armonk, NJ, USA). The alpha criterion for all analyses was set at 0.05. Data were analyzed using Cronbach's Alpha, Chi Squared, Pearson's Correlation coefficient, t-test, and analysis of variance (ANOVA).

Results

The IA assessment score was considered alone, in comparison with questions from the psychiatric condition assessment, and with the self-reported personal responses to identify between group differences and correlational relationships.

The IA assessment was completed by 1491 participants and was reliable [N = 1491; Chronbach's Alpha = 0.98; mean = 48.60; median = 62.50; minimum = 0; maximum = 100; SD = 26.06]. Further, all constructs within the IA assessment were reliable (Table 1).

The Psychiatric symptom questionnaire was completed by 1491 participants. Each construct--representing an independent psychiatric condition--was reliable (Table 2).

Table 1

Mean Score and Reliability by Construct -- IA Assessment

Construct	N	Mean	Std Dev	Chronbach's Alpha
Total IA Test	1491	48.60	26.06	0.98
Preoccupation	1491	53.39	26.29	0.86
Increased Time	1491	47.08	29.29	0.92
Can't Quit	1491	48.08	28.20	0.89
Withdrawal	1491	33.89	22.75	0.93
Lost Time	1491	49.39	28.76	0.91
Jeopardize Life	1491	46.14	28.52	0.90
Lied	1491	45.36	29.75	0.92
Escape	1491	54.45	25.99	0.92

Table 2

Mean Score and reliability by Construct -- Psychiatric symptom Assessment

Construct	N	Mean	Std Dev	Chronbach's Alpha
Anxiety	1491	48.90	27.13	0.94
Binge Eating	1491	42.88	30.00	0.97
Attention Deficit	1491	44.84	27.99	0.96
Social Anxiety	1491	49.45	28.45	0.93
Depression	1491	44.69	28.29	0.95
Disruptive Mood	1491	40.77	31.57	0.94

There was a significant difference in mean scores in subjects grouped by age [$F(7, 1491) = 27.71$; $p. < 0.001$], ethnicity [$F(6, 1491) = 18.82$; $p. < 0.001$], annual income [$F(11, 1491) = 4.15$; $p. < 0.001$], and by education [$F(17, 1491) = 9.91$; $p. <0.001$]. However, there was no significant difference by sex [$F(3, 1491) = 2.01$; $p. = 0.111$]. Mean scores by age, ethnicity, annual income, and education are in Table 2, Table 3, Table 4, and Table 5-- respectively.

Table 2

Mean IA Score by Age Group

Age	Left Blank	> 18	18 - 20	21 - 29	30 - 39	40 - 49	50 - 59	60 +
N	9	1	58	559	539	194	86	45
Mean IA Score	53.69	83.97	57.93	55.43	49.45	38.09	28.05	24.40

Table 3

Mean IA Score by Ethnicity

Ethnicity	Left Blank	Multiple Ethnicity	White/ Caucasian	Black/ African American	Hispanic	Asian/ Pacific Islander	American Indian/ Alaskan Native
N	9	29	662	110	80	563	38
Mean IA Score	53.69	32.06	42.54	46.44	48.93	55.82	64.20

Table 4

Mean IA Score by Education

Level Of Education	Left Blank	High School or Less	1 Year of College	2 Years of College	3 years of College	Graduated From College	Some Graduate School	Completed Graduate School
N	9	150	44	111	144	792	67	174
Mean IA Score	53.69	50.68	36.92	34.66	54.50	52.86	49.26	41.41

Note. Education represents the highest level achieved.

Table 5

Mean IA Score by Income

Annual Income	Left Blank	0-9	10	20	30	40	50	60	70	80	90	100
N	9	250	206	222	182	144	172	80	90	51	32	53
Mean IA Score	53.69	42.18	48.96	47.88	46.22	50.29	57.45	49.79	52.55	46.52	55.87	43.62

Note. Annual Income values represent thousands: 20 = $20,000 per year.

The total IA score was most highly correlated with attention deficit and depression [N = 1491; r = 0.88; p. = 0.000 and N = 1491; r = 0.85; p. = 0.000]. The IA score was also correlated with disruptive mood, binge eating, general anxiety, and social anxiety [N = 1491; r = 0.83; p. = 0.000 and N = 1491; r = 0.83; p. = 0.000 and N = 1491; r = 0.82; p. = 0.000 and N = 1491; r = 0.80; p. = 0.000]. Individual constructs within the IA assessment were also correlated (Table 6).

Table 6

Construct to Psychiatric Symptom Correlations

Construct	Statistics	General Anxiety	Attention Deficit	Social. Anxiety	Depression	Disruptive Mood	Binge Eating
Preoccupation	N r	1491 .73	1491 .79	1491 .71	1491 .74	1491 .68	1491 .70
Increased Time	N r	1491 .76	1491 .82	1491 .75	1491 .80	1491 .81	1491 .80
Can't Quit	N r	1491 .73	1491 .79	1491 .71	1491 .76	1491 .75	1491 .76
Withdrawal	N r	1491 .76	1491 .83	1491 .74	1491 .81	1491 .81	1491 .80
Lost Time	N r	1491 .74	1491 .81	1491 .72	1491 .77	1491 .74	1491 .75
Jeopardize Life	N r	1491 .79	1491 .88	1491 .78	1491 .83	1491 .82	1491 .82
Lied	N r	1491 .73	1491 .82	1491 .73	1491 .79	1491 .82	1491 .80
Escape	N r	1491 .77	1491 .75	1491 .75	1491 .76	1491 .67	1491 .69

Discussion

The reliability of the total IA assessment and reliability of constructs in both the IA test and psychiatric condition test signifies that the diagnostic measures developed for this study have adequate psychometric properties.

Using a form of Beards diagnosis--a score of ⅝ (62.5 on the IA assessment)--35% of the MTurk generated representative US population sample met the criteria for Internet Addiction. There are two reasons for identifying a higher addiction rate than any previous studies: Mainly,

IA rates are increasing with time. Earlier studies on IA prevalence identified lower rates than did more recent studies. Second, the data may be skewed because the sample was a group of internet workers. If individuals were tested off the internet, and an internet medium was not used to employ participants, the IA rate may have been lower.

The significant correlations between IA severity and specific psychiatric symptoms supports previous research on IA and correlating psychiatric conditions (Anasari, 2017; Cash, 2012 ; Chakraborty et al., 2010; Shapira et al., 2003). Further, attention deficit and depression seem to be the most connected to IA; although, all psychiatric symptoms tested showed strong correlations to IA severity. The high correlations between all constructs in the IA assessment and the overall IA score supports previous research on addictive behavior (Anasari, 2017; Cash, 2012). Further, the significant drops in mean IA severity by age support Anasari (2017).

IA behaves like other addictions in its correlated comorbid psychiatric symptoms and has a highly impactful prevalence rate. Thus, this study provides ample evidence for the placement of Internet Addiction in the next revision of the Diagnostic and Statistical Manual of Mental Health disorders.

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