Review of Internet addiction comorbities and physiological parameters

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Abstract

Despite the growing research collective regarding Internet Addiction (IAD) and its demographics, lifestyle influences, and predictors very little experimentation has been done to assess IAD comorbidities and associated physiological parameters [1]. Cross-sectional studies that have been performed often determine a high comorbidity rate of IAD with psychiatric disorders such as attention deficit hyperactivity disorder (ADHD) and affective disorders [2]. However, despite a similar associative incidence rate, Borderline Personality Disorder (BPD) is seldom mentioned in such analysis'. This article attempts to highlight IAD comorbidities with particular emphasis on the literature written regarding BPD and IAD. It will also examine various physiological parameters that have been assessed and suggest possible treatment modalities that may be effective for this morbidity in the future.

Keywords: Internet Addiction, comorbidity, physiological parameters

Background and significance

IAD involves excessive and unrestrained time allocated to internet use which may result in behavioral narrowing such as emotional and psychological discord; time management issues; loss of control, and modification of the addicted person's mood and behavior [2-4]. Pathological Internet use was first identified in the late 1990's and has since been the focus of a limited but growing number of investigations assessing the consequences of IAD on a person's well-being [5]. Researchers have examined such varied topics ranging from the the dietary habits of those with IAD to the association between IAD and suicidal behaviors [6,7]. IAD investigations often conclude that attention-deficit/hyperactivity disorder and depression are among significant risk factors and predictors of internet addiction [8,9]. However, IAD and its comorbidities have not been fully identified and examined. Such investigations are needed to further understand IAD and its significance among various associated psychiatric disorders.

Psychiatric comorbidities

In one of the most significant IAD studies, Black et al analyzed demographic, clinical features, and psychiatric comorbidity in subjects with compulsive computer use behavior [10]. The participants all reported unrestrained computer use that caused personal distress and interfered with occupational or social functioning. Each subject completed assessments which included the Minnesota Impulsive Disorders Interview, the Personality Diagnostic Questionnaire-Revised (PDQ-R), a computer version of the Diagnostic Interview Schedule (DIS), and an abbreviated version of the Medical Outcome Study Short Form-36 (SF-36).

Black reports that his average participant was a single white male who was 32 years old and had a yearly income of $27,000. Typically the person's problematic computer usage began at the age 29 when he used the device approximately 27 hours per week. About half of the 21 participants reported academic problems resulting from their excessive computer use. In addition, a significant number reported missing school or work because of their unregulated computer use. Approximately half of the subjects noted that family members had actually confronted them about their computer usage and more than 50% of the individuals had attempted to reduce their time devoted to using the computer.

According to the DIS results, 38% of the study's participants had a substance abuse problem, 33% had a lifetime mood disorder, and 19% of the subjects had an anxiety disorder. The PDQ-R results suggest that 52% of the participants had elements of a personality disorder of which the most common were the borderline, narcissistic, and antisocial types. Disorders regarding Impulse-control such as compulsive buying were also common among participants. On the SF-36, participants showed impaired mental health functioning compared to a normal control sample. Black concludes that individuals reporting compulsive computer use often possess psychiatric comorbidities and resultant emotional distress.

Ha et al used a structured interview process to further analyze individuals with problematic internet use to assess clinical comorbidity [11]. A random sample of children and adolescents who screened positive for IAD were, examined using the K-SADS-PL-K for children and SCID-IV for adolescents. The researchers noted that individuals with Internet addiction had various comorbid psychiatric disorders which may differ with age. For example, in the group of children, attention-deficit/hyperactivity disorder (ADHD) was a predominant comorbidity. However, in the adolescent group, comorbidities included major depressive disorder, schizophrenia, and obsessive-compulsive disorder. While clinicians can not deduce that problematic internet use is a cause or consequence of these various disorders, Ha et al point out the need to observe the potentiality of age-specific comorbid psychiatric disorders regarding Internet addiction.

Psychological well being and IAD has been further assessed on a large scale using a sample size of 13,588 Internet users from a major portal site in South Korea [12]. The participants were examined by Whang et al regarding internet over-use and related psychological profiles by the level of internet use. 7,878 males and 5,710 females were investigated using a modified Young's Internet Addiction Scale. 3.5% of the participants were identified as internet addicts (IA), and a further 18.4% were classified as possible internet addicts (PA). The Internet Addiction Scale results correlated significantly with dysfunctional social behaviors. More IA subjects seemed to try to create an alternative reality compared to PA and Non-addicts (NA). IA subjects exhibited the highest degree of depression, loneliness, and compulsivity compared to other groups and had a high tendency to access the internet as a reaction to stressful events or depression. Furthermore, the IA participants were noted to be more vulnerable to interpersonal dangers compared to the other groups by exhibiting an unusual affinity and feeling of closeness towards strangers. Continued research is necessary to further investigate the direct relationship regarding internet dependency and psychological well-being.

With regards to motivation of internet dependency, Tosun et al suggest that a subject's tendency to express their "true self" on the Internet, often has a positive correlation with psychoticism and neuroticism [13]. Furthermore, after considering eleven potential addictions including internet addiction, Sussman et al suggest that a broad range of substance and process addictions may serve similar roles [14]. The author further suggests that approximately 47% of the U.S. adult population may have maladaptive signs of an addictive disorder during a consecutive 12-month time span. Also, it may be beneficial for clinicians to consider addictions deriving from problems of lifestyle in addition to personality factors.

Bernardi et al performed a descriptive patient analysis focusing on clinical, demographic features, and comorbidities regarding internet addiction and suggest that social detachment may be an explanation for the lure of the Internet [15]. Therefore, the researchers assessed various dissociative symptoms in patients and their association with IAD disability. Bernardi's group screened a sample of 50 adult outpatients using to internet addiction scale and excluded those who used the internet for a single purpose such as gambling or gaming. The researchers concluded that various dissociative symptoms examined are related to impact and severity of IAD. Patients were on the internet approximately 42 hours each week and their internet usage appeared to be more compulsory than mood driven or rewarding. Common clinical diagnoses among the sample population occurred at similar frequencies and included attention deficit and hyperactivity disorder, social anxiety disorder, and borderline personality disorder.

BPD and IAD

Bray et al discuss understanding BPD with regards to the extended mind theory, a concept which implies that computers or other external objects may be considered as an extension of a person's mind [16]. Bray observes that BPD patients are deficient regarding their ability to regulate affect, control impulses, and achieve other cognitive tasks. Therefore, they will often integrate, as Bray states, "the brains" of those close to them, to amplify or increase the efficiency of their own cognitive apparatus when performing these intrinsic actions. To integrate another person or external device in such a way requires a profound intellectual or informational bond in addition to sustained accessibility. This most likely explains BPD patients' anxiety and despair regarding abandonment which could literally mean losing one's mind or extended mind in this case. For a BPD sufferer it may appear to be worth any attempt to avoid such a loss.

Similarly, cognitive models focusing on interpersonal situations in borderline personality disorder (BPD) patients, indicate that a principle cause for their instability is dichotomous thinking (DT) [17]. Likewise, object-relation theories suggest that splitting is also important in BPD. Sieswerda et al investigated BPD patients to note if the participants utilize dichotomous thinking and schema-specific evaluations during non interpersonal situations. The researchers designed an experiment using computer games which the patients played to produce either frustrating or rewarding situations. Afterwards, the subjects assessed themselves and the games. Patients

with BPD were generally rated with more extreme game evaluations in the emotionally negative situations compared to normal controls and those participants with antisocial or a cluster C personality disorder. The researchers concluded that the BPD patients were distinguished optimally by the general negative evaluative style and characterized less by splitting or DT.

Unoka et al explain that patients with BPD demonstrate severe difficulties regarding impulse control and interpersonal relationships [18]. The researchers used internet based experimental risk and trust games to examine whether BPD patients exhibit less trust and increased risk-taking behavior compared to those persons in a control population and patients with depression and different personality disorders. The authors determined that patients with BPD demonstrate less trust during interpersonal interactions, which may account for various relationship problems and may also be associated with dissociation, identity disturbance and stress-related paranoia.

Physiological parameters

Despite the limited but growing research regarding IAD and its comorbidities, very little has been done to assess associated physiological parameters [1]. Lu et al analyzed and compared various autonomic nervous responses between high- and low-risk IA abusers in order to assess possible implications regarding internet addiction treatment and prevention. The researchers noted different physiological responses between the two subject populations as the participants surfed the Internet. Respiratory response (RESPR), peripheral temperature (PTEMP), blood volume pulse (BVP), and skin conductance (SC) were recorded for each of the 52 participants aged 18-24 years. Subjects were also screened using the Chen Internet Addiction Scale (CIAS, 2003), and classified as either high- or low-risk regarding possible internet addiction. The study reports that CIAS scores were both positively and negatively associated with RESPR and PTEMP. the RESPR and PTEMP of high-risk subjects were stronger and weaker, respectively, compared to the measures from the low-risk participants.

The SC and BVP of the high-risk group were decreased and increased respectively and relative to low-risk participants. the researchers therefore, suggest that the different autonomic responses may be distinguishingly sensitive to internet abusers' potency with regards to the IA autonomic activity hypothesis. The increased RESPR and BVP reactions and the decreased PTEMP responses of the high-risk participants suggest that the sympathetic nervous system was activated in this population. In contrast, the SC responses indicate simultaneous parasympathetic activation in the high-risk population.

Zhu et al used intervention and encephalofluctuogram techniques to assess the combined therapeutic effect of electroacupuncture (EA) and psychological interference on internet craving and anxiety in internet addiction disorder (IAD) [19]. Patients with IAD were assigned to one of three groups including an EA group, psychotherapy group, and a combined EA and psychotherapy group. Six specific accupuncture regions for the EA group were selected and therapy was administered for twenty regular sessions. In the psychotherapy group, cognition and behavior therapy was conducted for 10 sessions. Finally, both EA and psychotherapy regimes were administered for the combined therapy group. Changes were noted after completion of each treatment regime with regards to IAD self-scale table, network craving scale, ZUNG self-rating anxiety scale (SAS), and the S spectrum of encephalofluctuogram (ET). In the combined therapy group, the IAD self-scale table results, as well as the network craving scale, ZUNG SAS, and S11 spectrum were each reduced significantly compared those scores before treatment. Furthermore, the combined therapy group's IAD self-scale table results and S11 spectrum were significantly decreased when compared to those of both the EA group and psychotherapy group. Combined therapy also produced a lower score of network craving scale than that in the psychotherapy group. Zhu et al conclude that combined therapy using EA and psychological interference may reduce network craving and anxiety in IAD patients. The authors speculate that the mechanism is most likely due to a central nervous system dopamin decrease.

Han and Renshaw propose that Bupropion Sustained Release (SR) may alter brain activity and reduce symptoms of craving in various forms of internet addiction [20]. Bupropion has been successfully used to treat patients with substance abuse and dependence due to its weak inhibition of dopamine and norepinephrine reuptake and the researchers suggest that similar alterations in brain physiology can reduce cravings for internet addiction. Han et al devised two experiments which support their hypothesis. In one investigation, Han suggests that Bupropion SR administration for 6 weeks would diminish video game cue-induced brain activity and subside craving for Internet game play in patients with Internet game play addiction (IAG). Investigators compared various assessment parameters and functional MRI results before and after treatment. They noted that after the 6 week Bupropion SR regime that cue-induced brain activity in dorsolateral prefrontal cortex, craving for Internet video game play, and total game play time, and were all decreased in the IAG participants.

In an additional experiment, Han and Renshaw note that excessive online game play (EOP) is often related to major depressive disorder (MDD) [21]. Since Bupropion

has been examined as a possible treatment for MDD as well as substance dependence, the authors hypothesize that bupropion treatment may also decrease the severity of EOP as well as depressive symptoms. the 12 week prospective trial investigated the effects of buproprion treatment on various subjects with both EOP and MDD in a fifty person sample. Han et al determined that Bupropion definitively improved depressive mood and decreased the severity of EOP in subjects with comorbid EOP and MDD.

Conclusion

In conclusion, the various research examined suggests that individuals assessed with IAD may often possess psychiatric comorbidities which range from major depressive disorder, schizophrenia, and obsessive-compulsive disorder to BPD [10,11]. Continued research is warranted to further investigate the direct relationship regarding internet dependency and an individual's psychological well-being [12]. Understanding comorbidities as well as physiological parameters will help clinicians understand what patients are currently experiencing and will help to predict trends that may occur in the next decades as more internet ready devices are introduced to the market. Clinicians may also use this knowledge to assess various treatment options and use the information gathered to help educate patients regarding specific regimes which may successfully treat and possibly prevent IAD.

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