



## Review article

## Clinical approaches to treatment of Internet addiction

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## ABSTRACT

**Background:** Internet appearance was one of the main breakthroughs for the mankind in the latest decades. It revolutionized our lives in many aspects and brought about many undeniably positive changes. However, at the same time caused negative consequences. It has led to the emergence of the Internet addiction (IA). The paper is concerned with the issue of treatment of IA.

**Method:** The paper reviews the current findings on the approaches to IA treatment and evaluates their effectiveness. The main focus of the article concentrates on cognitive and pharmacologic treatment.

**Results:** The individual approach to IA treatment is advisable. Among drugs for the management of IA, antidepressants, antipsychotics, opioid receptor antagonists, glutamate receptor antagonists, and psychostimulants may be recommended. Some antiepileptics, and especially valproate, are considered as potential drugs for the treatment of IA.

**Conclusion:** Effective therapy may require an individual approach and best results are expected when psychological and pharmacological treatments are combined.

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## Introduction

In the times of rapid development of digital technology and the increasing number of Internet users, we face the emergence of new types of addiction associated with the use of various devices connected to the network. The rising number of publications on the

issue of Internet addiction (IA) reveals the seriousness of this problem [e.g., 4,14,25,27,35]. The main aim of our review is to present different approaches in the therapy of IA with special focus placed on Cognitive-Behavioral Therapy (CBT), pharmacology, and their application in the therapy of IA. EBSCO search (using the following keywords: therapy of IA, pharmacological treatment of IA, psychological therapy of IA) returned 592 records, including such databases as Medline, Eric, PsycArticles, PsycCritiques, PsycExtra, PsycInfo, PsycTest, or Academic Search Complete. The search was limited to full-text papers published up until 2012.

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Recently, there has been a heated debate [e.g., 4,27,42] on whether IA should be included in DSM-5 classification as a distinct clinical disorder or as a subtype of other disorders. There are still some issues that should be dealt with. Byun et al. [6] underlined the ambiguity in defining IA disorder itself, pointed out the lack of standardized inclusive criteria for IA, and criticized methodological shortcomings ranging from inadequate methods for sample recruitment to methods of data analysis. This problem has also been considered by King et al. [22] who especially highlight inconsistencies in the definitions and diagnosis of IA, no randomization and blinding, and the lack of proper control groups. According to the recently published DSM-5, the IA was not included in the new classification; it was classified as a disorder that needs further research.

### Cognitive-Behavioral Therapy of IA

CBT has been applied to treatment of many disorders such as substance abuse [e.g., 38], eating disorders [e.g., 2], or affective disorders such as depression [e.g., 43], or anxiety [e.g., 3]. Its effectiveness has also been positively verified in the case of IA [20,42]. The aim of CBT is for the patients to learn how to control their thoughts and feelings that can be detrimental to their functioning and may trigger impulse to escape into the virtual world. The addicts gradually learn how to solve problems in a more constructive way and how to prevent themselves from destructive use of the Internet [42]. At the first stage of the therapy the main focus is put on the behavioral aspects, at subsequent stages the focus is shifted to developing positive cognitive assumptions. During the therapy, addicts identify false beliefs and learn how to modify them into adaptive ones.

Although Young [41] recognized the similarity between IA and other compulsive syndromes, she indicated the specificity of this disorder and proposed a unique model of treatment based on CBT specially designed for handling IA. The first phase is about behavior modification and setting a specific and realistic goal that helps to avoid relapse. Patients will keep a daily Internet log in which they will record their online activity (e.g., day, duration, event, online activity, outcome). The aim is to reduce the number of hours spent online as well as to structuralize online activity, to eliminate all the temptations in the form of favorite files or websites, and to learn to control one's Internet usage. The therapist creates a new schedule in order for the patient to gain new habits. In the second stage, the therapy is concentrated on the cognitive aspects of addiction: the thoughts that trigger excessive online activity. It is aimed at reducing maladaptive cognitions. The whole process of change is labeled as cognitive restructuring; it is supposed to reveal the pattern of engagement in online activity and to show what kind of need addicts seek to satisfy in the virtual world. In this phase, patients face the problem and get rid of the false assumptions about their Internet use. In the third phase, they deal with real problems existing in their lives that led to addiction. Harm reduction therapy is applied as well in order to reduce coexisting problems such as addiction to drugs or alcohol, anxiety, or depression. In the case of modeling new habits, Young [41] points out that it is difficult to use and inadvisable to recommend total abstinence from the computer and the Internet, because they have become a regular part of almost every job/education. Total abstinence may apply only to those devices that are central to the main symptom itself, such as massively multiplayer online role-playing game. In addition, the patient must learn new behaviors while deriving the benefits of technology.

Du et al. [10] investigated the effectiveness of CBT in a group of addicted adolescents. Fifty six patients aged 12–17 years participated in the study. The therapy improved time management skills with regard to the use of time and control over time usage. It

reduced emotional (especially anxiety-related), cognitive, and behavioral symptoms. A study was done by Kim et al. [21] on 65 depressed adolescents with excessive online game play. During the therapy, the severity of Internet use, depression, anxiety, life satisfaction, and school adaptation were measured three times: at the beginning, 8 weeks after the therapy, and in the 4-week follow-up post-treatment period. In one of two groups, CBT was applied in combination with bupropion. Those participants who were subjected to CBT therapy scored higher on life satisfaction and lower on Young Internet Addiction Test. Anxiety was only increased in the control group without CBT treatment. There was no significant change in reference to depression. Young [42] investigated the effectiveness of CBT on 114 patients of Center for Online Addiction. CBT had a positive influence on their behaviors, and the number of symptoms of compulsive Internet use decreased in the majority of the participants. After the therapy, patients exhibited a more proactive lifestyle. Fang-ru and Wei [12] examined the effectiveness of integrated psychosocial intervention in a group of 52 adolescents with IA disorder. Solution-Focused Brief Therapy (SFBT) was applied together with family therapy for 3 months. The symptoms of IA and the amount of time spent online decreased, general psychological functioning improved. Rong et al. [29] proved the effectiveness of psychotherapy, especially cognitive and behavioral therapy, among 23 middle school students. Some of the programs offer elements of CBT. Kim [21] has proposed applying Reality Therapy Group Counseling Program, based on Choice Theory or Reality Therapy. Offered to Korean students, the therapy includes techniques such as: control theory, five basic needs, total behavior, friendly involvement, and making a plan. The author also proposes introducing cognitive-behavioral elements into the therapy, for instance time management techniques or reminder cards. German scientists [19] have examined short-term treatment of Internet and computer addiction (STICA). The proposed therapeutic program is based on the cognitive-behavioral approach, with both individual and group therapy sessions, which last four months. Individuals are randomly selected for the STICA and the control group. The STICA therapy puts the emphasis on the reintegration of the patient's life, controlling the time spent at the computer and changes in social habits.

Psychological treatment of IA is shown in Table 1.

### Pharmacotherapy in the treatment of IA

According to the recent findings by Liu et al. [23], an involvement of the reward system in the pathophysiology of IA seems quite obvious. This conclusion was based upon the results of functional magnetic resonance for adolescent Internet addicts. The results provided data indicating distinct synchronization between frontal cortex and limbic lobe and between cerebellum, brainstem, and limbic lobe. However, as suggested in a review by Camardese et al. [8], the neuroimaging data on IA are limited and thus cannot give any helpful clues on pharmacologic treatment. These authors believe that one may rely on striking similarities between behavioral or substance addiction and IA. To be true, some pharmacologic interventions in Internet addicts have been taken based on recommendations extrapolated from other forms of addiction. Some treatments described in the existing literature are reviewed below.

#### Antidepressant drugs

Considering that major depression may be relatively frequently encountered in Internet addicts [31,38], some antidepressant drugs have been tried against IA. One of the examples is escitalopram, an S-enantiomer of citalopram, belonging to

**Table 1**  
Psychological treatment of Internet addiction.

Cognitive behavioral therapy	Number of patients	Results	Reference
Time management skills	56 patients aged 12–17 years	Improved time management skills	[10]
Solution-Focused Brief Therapy with family therapy	52 adolescents	Internet Addiction Disorder and online time decreased; improved psychological function	[12]
Group with individual therapy; diaries, social skill training, and exposition training	192 patients	Reduced and controlled Internet and computer use	[19]
CBT in combination with bupropion	65 depressed adolescents	Reduced on-line game play and anxiety, improved life satisfaction	[21]
Cognitive or behavior therapy	23 middle school students	Reduced Internet addiction symptoms	[29]
(1) Behavior modification; (2) cognitive restructuring; (3) harm reduction therapy	Not available	Reduced time spent online	[41]
Monitoring dysfunctional thoughts; learning new coping skills to prevent a relapse; time management	114 patients	Sustained motivation to attend the therapy, improved online time management, reduced social isolation and sexual dysfunction, increased abstinence from problematic applications	[42]

selective serotonin reuptake inhibitors [11], which has been tried in a group of 19 Internet addicts in the 10-week open-label phase in a daily dose of 20 mg [9]. Having completed the 10-week period, almost 65% of addicts experienced significant reductions in the amount of time spent online. After 10 weeks, the patients were randomized to either a drug or placebo group and, strikingly, the therapeutic effect persisted at comparable levels in both groups. This may suggest the possibility that, actually, the beneficial drug's effect can be questioned and a placebo response also has to be considered. The effectiveness of escitalopram in Internet addicts was verified by Sattar and Ramaswamy [30], who administered this drug at 30 mg daily to an addict for a period of 3 months. Within this curative period, a significant reduction in drive to online gaming as well as an improvement in mood were observed. However, this is only a case-report study, to which significant statistical power cannot be ascribed.

Some evidence seems to highlight bupropion—a heterocyclic atypical antidepressant, enhancing dopaminergic and noradrenergic neurotransmission [11], also used for smoking cessation as a partial nicotine receptor agonist [7] – as a promising agent against IA. Specifically, 11 game-addicted patients were administered bupropion for 6 weeks. The treatment resulted in significant reductions of both craving and the total time spent on gaming [15]. Also, neuroimaging provided evidence that brain activity in addicts (assessed in left occipital lobe, left dorsolateral prefrontal cortex, and parahippocampal gyrus) considerably decreased and did not differ from the brain activity of 8 healthy controls [15]. Bupropion was also administered in a 12-week randomized clinical trial to Internet addicts with major depression as a co-morbid condition [17]. Actually, bupropion itself was administered for 8 weeks and then a 4-week post-treatment phase would follow. Interestingly, online gaming was reduced to a considerable degree in both evaluated phases, while the symptoms of major depression were only alleviated in the drug-active phase [17].

#### Antipsychotic drugs

Among antipsychotic drugs, which mainly reduce dopaminergic and serotonergic transmission in the brain [33], olanzapine and quetiapine have already been tested in Internet addicts. However, olanzapine proved completely ineffective against pathological gambling [24]. Quetiapine apparently showed some beneficial efficacy in a case report study, but in combination with citalopram in a young female addict [1].

#### Opioid receptor antagonists

Based on the fact that opioid receptor antagonists diminish dopamine release in the reward system, they are considered for the

treatment of behavioral addictions (for review, see Ref. [8]). So far, only data from one case report study are available. Naltrexone (150 mg daily) was added to sertraline. The latter was completely ineffective in a 31-year-old male, exhibiting compulsive cybersexual behavior. However, the combined treatment effectively induced a remission lasting for 3 years [5].

#### Psychostimulants

It has been found that IA may coexist with attention-deficit hyperactivity disorder (ADHD), with comorbidity rate reaching 32.7% [34,40]. Han et al. [16] even reported the rate to be as high as 51.6%. This comorbidity may point, to a certain degree at least, to the common etiology of both disorders, associated preferentially with the functional deficiency of prefrontal cortex and reduced dopaminergic neurotransmission [35]. It is thus not astonishing that methylphenidate, a proven drug against ADHD [28,39], has been tried in ADHD children addicted to video gaming [26]. Sixty two drug-naïve children (52 males, 10 females) were included in the study. They had been evaluated using the Visual Continuous Performance Test, on respective IA and ADHD scales, with their total Internet usage time also being recorded prior to methylphenidate administration. Following 8-week administration of methylphenidate (the average maintenance dose was  $30.5 \pm 13.3$  mg per day; range: 18–54 mg daily), the children were reassessed and the results indicate significant beneficial outcomes on the IA scale, positively correlated with ADHD rating scale. Further, the patients showed considerable improvements in the Visual Continuous Performance Test, reflected by significant reductions in omission and commission errors, which was also accompanied by an increase in correct responses. Also, the Internet usage times were significantly shortened [16].

#### Glutamate antagonists

So far, there have been no data on the efficacy of glutamate receptor antagonists against IA. However, memantine (an N-methyl-D-aspartate receptor antagonist) shows some promise against pathological gambling which shares substantial similarities with IA [8]. Memantine (at a mean effective dose of  $23.4 \pm 8.1$  mg daily) was given to 29 subjects (18 females, 11 males) during a 10-week period of open-label study. Only one participant failed to complete the study – the remaining participants revealed reduced gambling and improvement in cognitive flexibility.

#### Potential drugs

Various kinds of addiction may emerge from the impaired function of the reward system. One can thus assume that positive

**Table 2**  
Pharmacological treatment of Internet addiction.

Treatment	Number of patients and treatment duration	Daily dose (mg)	Results	Reference
Escitalopram	19 (study a); 10-week open-label phase	20	In 65% of addicts a distinct reduction in the time spent online	[9]
Escitalopram	19 (study b); randomization after 10 weeks to a drug or placebo group	20	Therapeutic effect at the comparable level in both groups	[9]
Citalopram	1; 3 months	30	Reduction in time spent online and mood improvement	[30]
Bupropion	11 + 8 healthy controls; 6 weeks	Not available	Reductions of desire as well as the time spent on games Reduction in brain activity (in the left occipital lobe, left dorsolateral prefrontal cortex, as well as left parahippocampal gyrus). There are no differences when compared to the brain activity of 8 healthy controls	[15]
Bupropion	50; 12 weeks (8-week treatment and 4-week follow-up period); randomized, double-blind clinical trial	Not available	Reduction in symptoms of depression only in the drug-active phase, reduction in time spent online in the drug-active and drug-naïve phases	[17]
Olanzapine	42; 12 weeks; randomized, double-blind, placebo-controlled	2.5–15	Ineffective against pathological gambling	[24]
Quetiapine + citalopram	1	Quetiapine-200 + citalopram-40	Reduction in time spent online	[1]
Naltrexone	1 (exhibiting compulsive cybersexual behavior)	150	Ineffective	[5]
Methylphenidate	62 ADHD drug-naïve children; 8 weeks	The average maintenance dose was $30.5 \pm 13.3$ mg per day; range: 18–54 mg daily	Considerable improvements in the Visual Continuous Performance Test. Reduction in time spent online	[16]
Memantine	29; 10 weeks	At a mean effective dose of $23.4 \pm 8.1$ mg daily	Decreased pathological gambling and improvement in cognitive flexibility. One participant failed to complete the study	[8]

data from the successful treatments of other addictions or disorders with impulsive behaviors (e.g., pathological gambling or bipolar disease), may provide valuable clues for the search of other drugs for effective therapy of IA. Among antiepileptic drugs, some are effective against bipolar disease as mood stabilizers. These are carbamazepine, lamotrigine, and valproate [44], the latter being also recognized for its anticraving activity (for review, see Ref. [8]). Consequently valproate seems the best candidate among these particular drugs as a potential agent for the treatment of IA.

Experimental evidence points to group II metabotropic receptor agonists as potential agents reducing the rewarding potential of commonly abused drugs [26]. Interestingly, compounds acting at group II metabotropic glutamate receptors may also possess the potential to improve impulsive behaviors [37].

Goldsmith and Shapira [13] reported that the symptoms in 15 addicts out of a 20-member group improved after drug therapy. A too small sample does not permit to make any generalizations of results. So far, three reviews on the pharmacologic aspects of IA treatment are available [8,18,22]. Considering the limitations mentioned above, some initial clues on how to manage the problem are available. According to Camardese et al. [8], in the case of Internet addicts showing substance addiction co-existent with high level of discomfort and craving, an opioid antagonist would seem the best choice. When comorbidity with depression or anxiety is encountered, then a selective serotonin reuptake inhibitor may be considered. Bupropion may be recommended when Internet addicts exhibit symptoms of major depression [8]. Furthermore, Siomos et al. [32] presented the effectiveness of a combination of CBT and pharmacotherapy that was applied to 40 adolescents who had been diagnosed with IA disorder.

Pharmacological treatment of IA is shown in Table 2.

## Conclusions

Since the emergence of IA, a need for effective treatment is becoming more and more urgent and increasingly evident. On the basis of the studies mentioned above in which CBT and pharmacotherapy were applied, we may conclude that the

combination of these two therapies may be recommended as the most effective method in the treatment of IA. A recent meta-analysis study has revealed that both psychological and pharmacological interventions proved beneficial in the Internet addicts as regards time spent online, depression and anxiety [36]. It is of paramount importance to focus on changing the maladaptive habits of addicts as well as teaching them new constructive ways of using the Internet and implementing the control that they lost while using it. Pharmacotherapy may be a supportive kind of therapy in reducing the negative symptoms. However, effective therapy requires individual approach and must be adjusted according to the patient's needs, also because IA coexists with other disorders.

## Conflicts of Interest

The corresponding author (S.J. Czuczwar) received an unrestricted grant from GlaxoSmithKline and has lectured for GlaxoSmithKline, Janssen, UCB, and Sanofi-Aventis. The other authors have no conflict of interest to disclose.

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