

REVIEW

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Epidemiologic and clinical updates on impulse control disorders**A critical review**

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Abstract The article reviews the current knowledge about the impulse control disorders (ICDs) with specific emphasis on epidemiological and pharmacological advances. In addition to the traditional ICDs present in the DSM-IV—pathological gambling, trichotillomania, kleptomania, pyromania and intermittent explosive disorder—a brief description of the new proposed ICDs—compulsive-impulsive (C-I) Internet usage disorder, C-I sexual behaviors, C-I skin picking and C-I shopping—is provided. Specifically, the article summarizes the phenomenology, epidemiology and comorbidity of the ICDs. Particular attention is paid to the relationship between ICDs and obsessive-compulsive disorder (OCD). Finally, current pharmacological options for treating ICDs are presented and discussed.

Key words impulse control disorders (ICDs) · obsessive-compulsive disorder (OCD) · pathological gambling (PG) · kleptomania · compulsive-impulsive (C-I) shopping · trichotillomania (TTM) · intermit-

tent explosive disorder (IED) · C-I Internet usage disorder · C-I sexual behaviors (C-ISBs) · C-I skin picking · pyromania

Introduction

Since the early 1990s, some researchers have suggested that the impulse control disorders (ICDs) might be conceptualized as a part of an obsessive-compulsive spectrum based on their clinical characteristics, familial transmission, and response to both pharmacological and psychosocial treatment interventions [1–3]. Over a decade of study and scientific developments have led a DSM-V task force to consider two important changes: separating obsessive-compulsive disorder (OCD) from the anxiety disorders and placing it in an autonomous category—the obsessive-compulsive spectrum disorders (OCSD); and creating several new autonomous disorders from those currently subsumed under ICDs not otherwise specified (ICD-NOS) [4], specifically including four new impulsive disorders, compulsive-impulsive (C-I) Internet usage disorder C-I sexual behaviors, C-I skin picking and C-I shopping. They are called compulsive-impulsive disorders due to the impulsive features (arousal) that initiate the behavior, and the compulsive drive that causes the behaviors to persist over time.

The relationship between OCD and the OC spectrum has been supported by studies over the past decade, although recent studies have also supported additional models. Recent neuroimaging (PET, fMRI etc.) and genetics studies have increased understanding of the biological and neuroanatomical characteristics of the ICDs and have supported both the OC spectrum model and suggested other models [5, 6]. The pharmacological options, moreover, have been expanded based on recent research; traditional

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treatment with the serotonin reuptake inhibitors (SRIs) supported the OC spectrum model, but recent research demonstrating the efficacy of different pharmacological interventions suggests that additional systems are involved and other models may be useful. For example, the efficacy of pharmacotherapies acting on different systems of neuromediators (opioid antagonists, mood stabilizers, dopamine reuptake inhibitors), support different theoretical models for the ICDs and make clear that it is valuable to look at the ICDs from different theoretical perspectives that suggest different mechanisms might be important and raise new research questions.

ICDs' phenomenology, epidemiology and relationship with OCD

ICDs are characterized by repetitive behaviors and impaired inhibition of these behaviors. Important defining criteria for these disorders include:

1. The failure to resist an impulse to perform some act that is harmful to the individual or others;
2. An increasing sense of arousal or tension prior to committing or engaging in the act;
3. An experience of either pleasure, gratification, or release of tension at the time of committing the act.

In addition, there is usually a pattern of engaging in the abnormal behavior in spite of adverse consequences (e.g., criminal changes, impairment of normal functioning, etc.). To demonstrate that a relationship exists between ICDs and OCD, there should be evidence that OCD is overrepresented in patients with ICDs and/or that ICDs are overrepresented in patients with OCD. Studies examining rates of OCD in patients with ICDs have reported inconsistent results, with some ICDs showing relatively high rates of comorbidity with OCD (trichotillomania, CI-shopping), and others demonstrating low rates

(intermittent explosive disorder, pathological gambling, and C-I sexual behaviors).

Pathological gambling (PG) is an impulse control disorder not otherwise specified (ICD-NOS) [4] that is characterized by recurrent and maladaptive patterns of gambling behavior that significantly disrupts the patient's functioning in the personal, familial, or vocational spheres. Recent studies suggest that the prevalence of PG is between 1% and 3% of the adult population [7, 8], and a meta-analysis [9] estimated that 86% of the population of the USA are recreational gamblers (Table 1). The disorder usually starts during adolescence with a prevalence of approximately 4–7% in this population. However, over the last decade, there has been an unprecedented expansion of legalized gambling throughout North America, and, as a result, the prevalence of PG can be expected to increase. The disorder is currently more common in men than in women. Recent national studies on PG prevalence have also been conducted in New Zealand [10–12], Sweden [13, 14], Switzerland [15], Australia [16] and Great Britain [17], and despite the use of different methodologies and variable technical quality, problem gambling prevalence studies have shown a high degree of consistency in their general findings.

A crucial issue to consider is the high rate of comorbidity among pathological gamblers. Patients with PG, at least those seeking treatment, have been found to score significantly higher than control populations on measures of depression [18], and have high incidences of various psychiatric disorders, including bipolar, anxiety and substance use disorders [19]. This frequent comorbidity is not surprising given the psychopathological core features of PG: impulsivity, compulsive drive to gamble, addictive features such as withdrawal symptoms during gambling abstinence, and bipolar features such as urges, pleasure seeking and decreased judgment due to unrealistic appraisal of the individuals' own abilities. Several authors have noted the link between various core features of PG and neurobiological characteris-

Table 1 Prevalence estimates of impulse control disorders

Impulse control disorder	Reference	Type of community	Prevalence reported
Pathological Gambling	Gerstein et al. (1999) Welte et al. (2001)	Adult population Adult population	1–3%
Trichotillomania	Christenson et al. (1991)	College students	1.5% males; 3.4 females
Pyromania	Kosky and Silburn (1984) Kolko et al. (1988) Jacobson (1995)	Children and adolescents Children and adolescents Children and adolescents	2.4–3.5%
Intermittent Explosive Disorder	Monopolis and Lion (1983) Coccaro et al. (2004)	Psychiatric surveys Adult population	1–2% Lifetime 11.1%; 1 month 3.2%
Kleptomania	Goldman (1991)	Adult population	0.6%
C-I Internet Usage Disorder	–	–	–
C-I Shopping	Black et al. (2001)	Adult population	2–8%
C-I Skin Picking	Doran et al. (1985) Gupta et al. (1986)	Dermatologic patients Dermatologic patients	2%
C-I Sexual Behaviors	Shaffer and Zimmerman (1990) Coleman, 1991	Adult population Adult population	5–6%

tics or treatment-response, and have conceptualized PG according to different models, thus placing it on different spectrums with the main psychiatric disorders of reference being OCD [1], addictive disorders [20], and affective disorders [21]. These models provide the theoretical rationale for the use of specific pharmacological treatments in PG. In addition, the models and related research findings may also suggest the presence of specific subgroups of patients with similar core features, comorbidity profiles and treatment-response within the population of pathological gamblers [22, 23]. The relationship between PG and OCD has allowed PG to be conceptualized as an OC spectrum disorder, within the impulsive cluster [1]. Patients with OC spectrum disorders, in fact, experience unpleasant feelings and physiological activation that result in an intense desire to perform a specific behavior in order to relieve the unpleasant feelings [24, 25]; this is the case in PG. In addition, a reduced capacity to resist gambling thoughts and urges leads to excessive gambling, in particular in the advanced phases of the disorder [26]. However, these patients differ from patients with OCD in important ways. Gambling behavior and thoughts are often experienced by these patients as ego-syntonic, while OCD obsessions and compulsions are generally ego-dystonic. In addition, the excessive doubt frequently experienced by OCD patients [24, 27, 28], as well as their harm avoidance, risk aversion and anticipatory anxiety [29], are not characteristic of pathological gamblers. OC spectrum disorders differ along the dimension of risk aversion vs. risk taking; the compulsive disorders are characterized by an overestimation of harm and by risk aversion while the impulsive disorders are characterized by an underestimation of risk and by risk seeking. Recently, the rate of comorbid OCD in individuals with PG was found to range from 1% to 20% [30] (Table 2).

Patients afflicted with trichotillomania (TTM) describe an overwhelming urge to pluck out specific hairs; when they do so, the anxiety is momentarily relieved but is quickly replaced by another compulsive urge to pluck and even greater anxiety [31]. The

exact prevalence of TTM is unknown; however, estimates from university surveys suggest that 1.5% of males and 3.4% of females endorse clinically significant hair pulling, with .6% endorsing all diagnostic criteria of TTM [32] (Table 1). The prevalence of non-clinical hair pulling behavior is even higher, up to 15.3%, in university surveys [33] (Table 1). In describing the phenomenological similarities between OCD and TTM, Swedo [34] highlighted the egodystonic feeling and the resistance experienced by patients with TTM and OCD. In addition, patients with TTM recognize the behavior as senseless, undesirable and performed in response to increasing anxiety, with resultant tension relief. Furthermore, a higher than normal incidence of both OCD and TTM has been reported in first-degree relatives of patients with TTM [35], and comorbidity data also support a relationship between OCD and TTM [36, 37] (Table 2). However, recent investigations [38, 39] have also included TTM in a spectrum of self-injurious behaviors (SIBs), including C-I skin picking, and underscored the phenomenological link among these SIBs and the differences between TTM and OCD [39].

In pyromania there is impulsive, repetitive, deliberate fire setting without external reward (e.g., arson for money, revenge, as a political act). There are very few community sample studies of firesetting, which is understandable since it is illegal and thus likely to be kept secret. The majority of epidemiological studies have focused on pyromania in childhood and adolescence and have reported the prevalence to be between 2.4% [40] and 3.5% [41, 42] (Table 1). In addition, several lines of evidence indicate that adolescent boys may be at higher risk for firesetting than adolescent girls [43, 44]. Among juveniles, firesetting is more prevalent in males than females, peaking between 12 years and 14 years [45]. Sixty percent of all fires in large U.S. cities are lit by individuals between 11 years and 18 years [46]. Besides young age, features such as temperament, parental psychopathology, social and environmental factors, and possible neurochemical predispositions [47] have been hypothesized to cause childhood pyromania. Some

Table 2 OCD rates in impulse control disorders

Impulse control disorder	Reference	Rates of OCD
Pathological Gambling	Argo and Black (2004)	1–20%
Trichotillomania	Christenson and Mansueto (1999)	3–27%
Pyromania	–	–
Intermittent Explosive Disorder	McElroy et al. (1998)	22%
Kleptomania	Presta et al. (2002)	6.5–60%
C-I Internet Usage Disorder	Black et al. (1999)	0% current; 10% lifetime
	Shapira et al. (2000)	15% current; 20% lifetime
C-I Shopping	Christenson et al. (1994)	12.5–30%
	McElroy et al. (1998)	
C-I Skin Picking	Simeon et al. (1997)	6–52%
	Arnold et al. (1998)	
	Wilhelm et al. (1999)	
C-I Sexual Behaviors	Kafka and Prentky (1994)	12–14%
	Black et al. (1997)	

authors have noted a close link between firesetting and aggression [48] and between firesetting and antisocial behavior [49]. In addition, published data have shown high rates of conduct disorder among young arsonists [50]. Recent findings, moreover, revealed associations between firesetting and shyness, aggression and peer rejection [51]. No published studies of the relationship between pyromania and OCD in terms of comorbidity or family history are available.

Intermittent explosive disorder (IED) is characterized by recurrent episodes of aggressive behavior that is out of proportion to psychosocial stressors and/or provocation and that is not better accounted by another mental disorder, comorbid medical conditions, or the physiologic effects of a pharmacologic agent or other substance with psychotropic properties [4]. Despite its inclusion in DSM for more than two decades, there are few studies of the lifetime prevalence of IED in either psychiatric or community settings. Clinical surveys of psychiatric inpatients [52], and clinical treatment studies on IED [53] had found rates of IED in psychiatric settings ranging from 1% to 2%. Recently, however, Coccaro and colleagues reported much higher rates of IED, 11.1% lifetime prevalence and 3.2% 1-month prevalence, in a community sample of 253 individuals [54] (Table 1). Based on these data, the authors estimated there are 1.4 million individuals with current IED in the US and 10 million with lifetime IED. As the authors suggested, prevalence rates so much higher than prior findings may reflect the changes in diagnostic criteria of IED from DSM-III [55] to DSM-IV [4] as well as the changes recently proposed in the development of research criteria for IED [56, 57]. A study by McElroy and colleagues reported rates of OCD in individuals with IED around 22% [58] (Table 2); recent studies investigating the rates of IED in patients with OCD have given lower estimates [59–61].

Kleptomania is a disorder in which the individual impulsively steals even though there is need to do so (i.e., the individual has money to pay for the stolen items or does not need the stolen goods). Like other ICDs, kleptomania is characterized by an anxiety-driven urge to perform an act that is pleasurable in the moment but causes significant distress and dysfunction [62]. The prevalence of kleptomania in the U.S. is unknown but has been estimated at 6 per 1000 people. [63] (Table 1). In addition, given the embarrassment surrounding kleptomania, it is often kept secret and thus goes undiagnosed [62]. Kleptomania is thought to account for 5% of shoplifting in the U.S. [64]. Based on total shoplifting costs of \$10 billion in 2002 [65], this 5% translates into a \$500 million annual loss to the economy attributable to kleptomania. This loss does not include the costs associated with stealing from friends and acquaintances or costs incurred by the legal system. Kleptomaniac behavior carries serious legal consequences: approximately 2

million Americans are charged with shoplifting annually [66]. If kleptomania accounts for 5% of these, this translates into 100,000 arrests. Recent studies assessing the rate of OCD in patients with kleptomania have given widely differing estimates, ranging from 6.5% to 60% [67, 68] (Table 2).

C–I Internet usage disorder, also referred as Internet addiction or problematic Internet use, has been proposed as an explanation for uncontrollable and damaging use of the Internet, and has only recently begun to appear in the psychiatric literature [69, 70]. People with problematic Internet use often report increasing amounts of time-spent web surfing, gambling, shopping or exploring pornographic sites. Others report spending time in chat rooms or corresponding by email. Frequently these people develop a preoccupation with the Internet, a need for escape to the Internet and increasing irritability when trying to cut back their Internet use. Ultimately, their attempt to cut back is unsuccessful. Functional impairments as a result of problematic Internet use include marital or family strife, job loss or decreased job productivity, legal difficulties or school failure [72]. Although diagnostic criteria for this disorder have been proposed, methods of assessing C–I Internet usage disorder are limited. In addition, although increasing research is being conducted on the topic, several published articles contain information that has not been empirically researched [73]. For some individuals, their excessive Internet use may be entirely accounted for by another Axis I disorder such as PG or C–I sexual behaviors; thus the Internet is functioning simply as another outlet for that disorder rather than being an additional disorder. Problematic Internet use has been reported in any age, social, educational, and economic range [74]. However, while previous studies tended to stereotype the classical Internet addicted patient as a young introverted man [75, 76], recent investigations have showed increasing rates of this disorder among women [74], as a result of the increased availability of the Internet. The prevalence of C–I Internet usage disorder is not known. Most of the studies related to this condition have been conducted with small samples. People enrolled, moreover, frequently had comorbid psychiatric diagnoses. In a recent study [71], Shapira and colleagues found that all subjects with problematic Internet use also met DSM-IV criteria for ICD-NOS. Studies assessing comorbidity rates between OCD and C–I Internet use reported estimates ranging from 10% to 20% for lifetime OCD and up to 15% for current OCD in Internet addicted patients [71, 77, 78] (Table 2). Further investigations on the epidemiology of this disorder are needed to clarify the scale and demographic characteristics of C–I Internet use.

C–I sexual behaviors (C–ISBs) include repetitive sexual acts and compulsive sexual thoughts. The individual feels compelled or driven to perform the behavior, which may or may not cause subjective

distress. Although generally not ego-dystonic, the behavior may interfere with several aspects of the patient's life, causing social or occupational impairment, or legal and financial consequences [79]. C-ISBs involve a broad range of paraphilic or non-paraphilic symptoms [80]. Paraphilic C-ISBs involve unconventional sexual behaviors in which there is a disturbance in the object of sexual gratification or in the expression of sexual gratification (e.g., exhibitionism, voyeurism). Non-paraphilic C-ISBs, on the other hand, involve conventional sexual behaviors that have become excessive or uncontrolled [80]. The true prevalence of C-ISBs remains unknown, given the heterogeneity of these disorders as well as the secretiveness of the condition for the majority of the afflicted patients. Investigations conducted in the early 1990s reported prevalence estimates of C-ISBs ranging from 5% to 6% of the US population [80, 81] (Table 1). Male patients have been traditionally reported to be more afflicted than women by C-ISBs [82, 83]. However, it is not clear how large this sex difference is and the extent to which the difference is due to men coming to the attention of professionals with greater frequency. Studies assessing the rates of OCD in patients suffering from C-ISBs [79, 84] reported estimates around 12% and 14% (Table 2).

C-I shopping, also referred as compulsive buying, is characterized by maladaptive preoccupations or impulses to buy or shop that are experienced as irresistible, intrusive and/or senseless, accompanied by frequent episodes of buying items that are not needed and/or that cost more than can be afforded. Frequently, these patients engage in these behaviors for longer periods of time than intended, and they experience distress and significant impairment in social and occupational performance. As specified for many other ICDs, the excessive buying or shopping behavior does not occur exclusively during periods of hypomania or mania [85, 86]. A recent study on C-I shopping disorder estimated the prevalence of this disorder to be between 2% and 8% of the general adult population in the US [87]; 80% to 95% of those affected are female (Table 1). Onset occurs in the late teens or early twenties, and the disorder is generally chronic. Previous studies investigating rates of OCD in patients with C-I shopping reported rates of 12.5% to 30% [86, 88] (Table 2); lower rates of compulsive buying have been found in patients with OCD (from 2.2% to 10.6%) [59–61], except for the study of Lejoyeux and colleagues (23.3%) [89].

Patients with C-I skin picking frequently present to dermatologists, and it has been estimated that about 2% of dermatology clinic patients may suffer from this condition [90, 91] (Table 1). Prevalence in the general population or in psychiatric clinics is unknown. Skin picking is often not a transient behavior but may persist with a waxing and waning lifetime course. It should be considered pathological when it becomes habitual, chronic and extensive,

leading to significant distress, dysfunction or disfigurement [38]. As reported by two recent studies, the majority of patients with C-I skin picking are women and their condition is assumed to be chronic, with excoriations on both single or multiple sites [92, 93]; the face is the most common site of excoriation but picking can involve any area of the body. Both studies found the majority of patients experienced increasing tension before the act (79–81%), relief after the act (52–79%), or both (68–90%). Comorbid lifetime rates of skin picking in patients with trichotillomania were approximately 10% in both studies [92, 93], whereas comorbid lifetime OCD was present in rates ranging from 6% to 19%. Wilhelm and colleagues [94] reported rates of OCD around 52% in a sample of 31 patients with C-I skin picking (Table 2). As mentioned for trichotillomania, the inclusion of C-I skin picking within a spectrum of self-injurious behaviors is receiving increasing support from clinical and neuroimaging studies [38].

Treatment options for ICDs

Treatment options for ICDs include both pharmacotherapy and psychotherapy. During the last decade, increasing research has been conducted on different pharmacological treatments across several ICDs; however, while the efficacy of various treatments has been investigated in double-blind studies for certain disorders (i.e., PG, IED, C-I shopping), systematic research of clinical treatment is still lacking for other disorders (see Table 3). In addition, a crucial issue to take into account when considering pharmacotherapy for patients with ICDs is the comorbidity with other psychiatric conditions such as affective and addictive disorders. The presence of bipolar or addictive comorbidity, in fact, will determine the most appropriate choice when different treatments have proven to be effective for a specific disorder.

PG is a good example of the importance of comorbidity determining treatment. PG has demonstrated a good response to selective serotonin reuptake inhibitors (SSRIs), mood stabilizers and opioid antagonists in double-blind studies [22, 95–99] (Table 3). Among all the antidepressants assessed so far, fluvoxamine [100], paroxetine [97, 98], citalopram [101], nefazodone [102], bupropion [103], (although only fluvoxamine and paroxetine in double-blind studies), the most convincing evidence is for the efficacy of the SSRIs. However, a major issue for this class of medication is the presence of bipolar spectrum comorbidity in some gamblers. This possibility needs to be carefully evaluated and excluded before treating pathological gamblers with antidepressants in order to avoid the possible reemergence of manic symptoms. The opioid antagonist naltrexone was effective in a double-blind trial, however, the risk of hepatotoxicity of this drug limits its use. Of note, the

Table 3 Treatment options for impulse control disorders as reported in blinded and unblinded studies

Impulse Control Disorder	Double-blind studies (references)	Outcomes	Other treatment options as reported in open-label trials
Pathological Gambling	Fluvoxamine vs. PC (Hollander et al. 2000; Blanco et al. 2002)	SSD for Fluvoxamine; No SSD between Fluvoxamine and PC.	Nefazodone, Bupropion, Citalopram, Divalproex, Topiramate
Trichotillomania	Paroxetine vs. PC (Kim et al. 2002; Potenza et al. 2003)	SSD for Paroxetine; No SSD between Paroxetine and PC.	
	Lithium vs. PC (Hollander et al. 2005)	SSD for Lithium;	
	Naltrexone vs. PC (Kim et al. 2001)	SSD for Naltrexone	
Pyromania	Clomipramine vs. Desipramine (Swedo et al. 1989)	SSD for Clomipramine;	Fluvoxamine, Citalopram, Venlafaxine, Naltrexone, Lithium, CBT
	Fluoxetine vs. PC (Christenson et al. 1991; Streichenvein and Thornby 1995)	No SSD between Fluoxetine and PC	
Intermittent Explosive Disorder	—	—	CBT and other psychotherapies
Kleptomania	*Lithium vs. PC (Campbell et al. 1984 and 1995; Malone et al. 1998 and 2000)	SSD for Lithium (in the Campbell' study of 1984, Lithium was associated to Haloperidol)	Clonidine
	*Divalproex vs. PC (Hollander et al. 2003 and 2005)	SSD for Divalproex	
	*Fluoxetine vs. PC (Coccaro et al. 1997)	SSD for Fluoxetine	
	*Carbamazepine vs. PC (Foster et al. 1989)	SSD for Carbamazepine	
	*Phenytoin vs. PC (Barratt et al. 1997; Stanford et al. 2001)	SSD for Phenytoin	
	*BBlockers vs. PC (Greenyke et al. 1986a and 1986b)	SSD for BBlockers	
	*Risperidone vs. PC (Buitelaar et al. 2001; Findling et al. 2001)	SS for Risperidone	
C-I Internet Usage Disorder	*CBT vs. PC (Alpert et al. 1997)	SSD for CBT	
	—	—	Fluoxetine, Paroxetine, Fluvoxamine, Divalproex, Lithium, Benzodiazepines Psychotherapy
C-I Shopping	Escitalopram vs. PC (Dell'Osso et al. 2006**)	SSD for Escitalopram	
C-I Skin Picking	Fluvoxamine vs. PC (Black et al. 2000; Ninan et al. 2000)	No SSD between Fluvoxamine and PC;	Fluvoxamine, Naltrexone
	Citalopram vs. PC (Koran et al. 2003)	SSD for Citalopram	
C-I Sexual Behaviors	Fluoxetine vs. PC (Simeon et al. 1997; Block et al. 2000)	SSD for Fluoxetine	
	—	—	Lithium, Tricyclics, Buspirone, Fluoxetine, Nefazodone, Sertraline, Naltrexone

SSD = statistically significant differences; CBT = cognitive behavioral therapy; PC = placebo

* Studies on patients with impulsive aggression features, rather than with a proper DSM diagnosis of IED

** Open-label study followed by double-blind discontinuation phase (Abstract)

opioid antagonist nalmefene has shown to be efficacious in preliminary findings with better tolerability than naltrexone [104]. Patients with other addictive disorders (alcohol and other substances) and intense urges and craving might particularly benefit from opioid antagonists. Mood stabilizers and anticonvulsants (lithium and divalproex assessed in double-blind controlled trials) have shown good results in recent studies without any specific contraindications for their use across the different subtypes of gamblers. In addition, gamblers with consistent affective instability may particularly benefit from these treatments.

Pharmacological treatment of TTM is not well established and, although SSRIs seem to show the best efficacy and safety, double-blind controlled studies on their use have given mixed results (Table 3). Clomipramine was found to be more effective than desipramine in a 10-week crossover study [105] conducted in the late 1980s. While subsequent uncontrolled studies found fluoxetine, fluvoxamine

and citalopram to be efficacious in patients with hair pulling [106–110], two controlled studies [111, 112] with fluoxetine could not replicate the positive findings reported with SSRIs in the open-label trials. Positive results have been also reported in uncontrolled studies with venlafaxine, lithium and naltrexone [113–116] as well as in open-label augmentation studies with SSRIs and pimozide [117, 118]. However, treatment response is often disrupted by significant relapse during ongoing pharmacological treatment [117]. In a recent controlled study [119] comparing cognitive behavioral therapy (CBT) to clomipramine and placebo, CBT had a dramatic effect in reducing symptoms of TTM and was significantly more effective than clomipramine or placebo, underscoring the efficacy of behavioral as well as pharmacological treatment in hair pulling.

To our knowledge, no controlled pharmacological trial has been conducted in patients with pyromania. Non-pharmacological interventions for firesetters,

including CBT [120], short-term counseling and day-treatment programs [121], have shown some efficacy. Undoubtedly, pyromania represents an ICD needing systematic pharmacotherapy research.

Treatment options for IED include the use of mood stabilizers, phenytoin, SSRIs, β -blockers, α_2 -agonists and antipsychotics (Table 3). Actually the majority of trials with these compounds have been conducted on individuals with impulsive aggression rather than with a specific diagnosis of IED, and several authors still don't consider the current criteria for the diagnosis of IED to be adequate [122]. Nevertheless, the presence of impulsive aggression within the core features of IED allows us to put aside this nosographic debate. Among mood stabilizers, the most convincing evidence comes from controlled studies with lithium (especially in children and adolescents) [123–127] and divalproex [128]. This last medication demonstrated significant efficacy in different populations of aggressive subjects [129, 130]. Carbamazepine has also shown some efficacy in a small double-blind study and in open-label trials [131, 132]. Phenytoin has showed positive results in two controlled double-blind studies [133, 134] at doses up to 300 mg/d. With regard to SSRIs, a double-blind placebo controlled trial of fluoxetine [135] in patients with personality disorder showed reduced scores on measures of irritability and aggression in patients taking the active medication. β -blockers propranolol and pindolol have also shown positive results in controlled studies [136, 137], reducing aggressive behaviors in patients with brain damage, although their concomitant diagnosis of IED might be arguable as the aggressive behaviors may have a different etiology. The α -agonist clonidine was reported to decrease aggression in an open-label trial [138] with adolescents at dosages of 0.4 mg/d, although the tolerability was a problem for some subjects. The atypical antipsychotic risperidone was also showed to be effective in treating aggression in controlled studies [139, 140]. Finally, controlled studies of behavioral interventions including CBT, group therapy, family therapy and social skill training have shown them to be valid treatments for aggressive patients [141, 142].

The pharmacological treatment of kleptomania includes SSRIs, mood stabilizers and opioid antagonists, although none of these medications have been tested in blinded, controlled trials so far (Table 3). Among SSRIs, fluoxetine, alone or in combination with lithium or tricyclics, was shown to be effective in several case-reports [64, 143, 144], as were fluvoxamine and paroxetine [145–148]. Mood stabilizer trials and reports in kleptomaniac patients showed mixed results for lithium [64, 144, 145], valproic acid [64, 149] and carbamazepine [64]. The opioid antagonist naltrexone was reported to be effective in two different case reports [148, 150]. Finally the benzodiazepines clonazepam and alprazolam provided some evidence of efficacy in treating kleptomania [64, 147]. In conclu-

sion, as discussed in a recent review [151], SSRIs seem to be the most promising treatment for kleptomania (19 of 30 cases of successful pharmacotherapy reported in the literature), either as monotherapy or in combination with other psychotropic drugs.

Given its recent recognition as a psychiatric problem, understandably no controlled pharmacological trials have been published on the treatment of C-I Internet usage disorder so far. Recently, Sattar and Ramaswamy [152] reported the case of a 31-year-old man with severe Internet addiction successfully treated with escitalopram (10 mg/d). Most treatment strategies for problematic Internet use have involved behavioral therapy techniques, which limit the amount of time on the Internet rather than requiring abstinence, as is done with many other addictions such as substance abuse. Self-help groups (both on and offline) are also being formed to address the problem. Our group has recently completed an open-label trial of escitalopram followed by a double-blind discontinuation phase in a population of C-I Internet users with preliminary positive findings [153]. Given the increasing use of the Internet in the new generations, a growing prevalence and incidence of this disorder is arguable. Clinicians treating subjects with ICDs should always assess the presence of this disorder in these patients given the relationship between C-I Internet use and some specific ICDs, such as pathological gambling and C-I sexual behaviors [154, 155]. Finally, controlled studies are expected in order to investigate the treatment response of Internet addicted patients to pharmacotherapy and psychotherapy.

Although C-I sexual behaviors seem relatively common, controlled trials on pharmacological treatments for these disorders are still lacking, and the available literature on this topic consists essentially of open-label trials and case-report series (Table 3). Positive findings have been reported with lithium and tricyclics [156–158], SRIs [159–162], buspirone [163, 164] and nefazodone [165]. As for other ICDs, the opioid antagonist naltrexone has recently shown to be efficacious in some case-reports [166]. Finally, different forms of psychotherapy have been shown to be effective for specific subtypes of C-I sexual behaviors [167].

There is some evidence that C-I shopping has been effectively treated with several different compounds (Table 3). McElroy's group [86] reported on 20 patients that benefited from antidepressants, often in combination with mood stabilizers. Black [168] reported fluvoxamine to be effective in patients without comorbid major depression, suggesting that improvement was independent of the treatment of mood symptoms. Naltrexone was found to be effective in a case series [169]. Two double-blind placebo-controlled trials [170, 171] did not confirm the superiority of fluvoxamine over placebo. However, these studies had the patients in both conditions keep a log of their shopping; keeping logs is a therapeutic intervention in itself and may have led to the failure of

the fluvoxamine and placebo groups to separate. An open-label trial of citalopram [172] and a subsequent open-label trial followed by double-blind discontinuation [173], neither of which using shopping logs, reported positive results. Studies comparing the efficacy of pharmacological treatment with psychotherapy have not been published yet.

Patients suffering from C-I skin picking often meet criteria for other psychiatric disorders (BDD and OCD), and frequently, due to medical complications of their psychopathology such as infection and scarring, they are referred to clinicians other than psychiatrists (i.e. dermatologists). The first controlled trial conducted by our group [97] found fluoxetine, at a mean dose of 55 mg/d for 10 weeks, significantly superior to placebo in decreasing the behavior in 21 adults with chronic pathologic skin picking (Table 3). More recently, a combined open-label and double-blind trial [174] confirmed the efficacy of fluoxetine in subjects with C-I skin picking. Previously, a retrospective treatment review of BDD patients with skin picking indicated that SRIs were effective in about half of 33 patients, whereas other agents were not [175]. In a subsequent open-label study [176], sertraline (mean dose: 95 mg/d) showed clinically significant improvement in 68% of 30 patients with skin picking after one month of treatment. Finally, uncontrolled psychodynamically oriented treatments and behavioral interventions have given mixed results described elsewhere [177].

Conclusions

Current knowledge on ICDs in terms of epidemiology and pharmacological treatment varies notably across these disorders, with recent and continuing advances for some (i.e. pathological gambling and C-I shopping), and anecdotal and obsolete data for others. Undoubtedly, given the high prevalence estimates of some ICDs (i.e. pathological gambling and C-I sexual behaviors) as well as their comorbidity with other major psychiatric disorders, this group of disorders represents a global problem. Nevertheless, certain ICDs (i.e. pyromania, C-I Internet usage disorder) still need systematic epidemiological and pharmacological research.

Studying the relationships between specific ICDs and other major psychiatric conditions (i.e. OCD, bipolar disorders, addictive disorders) in terms of phenomenological issues and comorbidity patterns is not only of theoretical interest; indeed, it provides the rationale for the use of specific pharmacological treatments and behavioral interventions. From this perspective, more than one decade after its introduction, the conceptualization of ICDs as obsessive-compulsive related disorders is still valid and has been confirmed by numerous studies; however, there is also evidence supporting the relationship between

ICDs and addictive and affective disorders. Not only are the different models of conceptualizing the ICDs not mutually exclusive, but they can contribute to recognize specific subtypes within the disorders. As a result, different models of conceptualization of ICDs have led new developments in pharmacologic treatment of these disorders, with positive results obtained with mood stabilizers and opioid antagonists in addition to the SSRIs.

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