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Refining the diagnostic boundaries of compulsive hoarding: A critical review

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ABSTRACT

Like most human behaviors, saving and collecting possessions can range from totally normal and adaptive to excessive or pathological. Hoarding, or compulsive hoarding, are some of the more commonly used terms to refer to this excessive form of collectionism. Hoarding is highly prevalent and, when severe, it is associated with substantial functional disability and represents a great burden for the sufferers, their families, and society in general. It is generally considered difficult to treat. Hoarding can occur in the context of a variety of neurological and psychiatric conditions. Although it has frequently been considered a symptom (or symptom dimension) of obsessive–compulsive disorder, and is listed as one of the diagnostic criteria for obsessive–compulsive personality disorder, its diagnostic boundaries are still a matter of debate. Recent data suggest that compulsive hoarding can also be a standalone problem. Growing evidence from epidemiological, phenomenological, neurobiological, and treatment studies suggests that compulsive hoarding may be best classified as a discrete disorder with its own diagnostic criteria.

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Contents

1. Phenomenology . . . 372
1.1. Obsessive–compulsive disorder . . . 373
1.1.1. Data that support that hoarding may be a symptom of OCD . . . 373
1.1.2. Data that support that hoarding may not be a symptom of OCD . . . 373
1.2. Obsessive–compulsive personality disorder (OCPD) . . . 374
1.2.1. Does the hoarding criterion 'belong' with the other OCPD criteria? . . . 374
1.2.2. Is compulsive hoarding associated with an increased risk for OCPD? . . . 374
1.2.3. What is the relation between the hoarding criterion of OCPD and OCD? . . . 375
1.3. Brain lesions . . . 375
1.4. Dementia . . . 375
1.5. Diogenes syndrome . . . 375
1.6. Animal hoarding . . . 376

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1.7. Developmetal and genetic disorders . . . 376
1.8. Schizophrenia . . . 376
1.9. Impulse control disorders . . . 377
2. Recent advances in hoarding research . . . 377
2.1. Epidemiology . . . 377
2.2. Family, twin, and molecular genetic studies . . . 378
2.3. Neuropsychology . . . 378
2.4. Animal and human lesion studies . . . 378
2.5. Neuroimaging . . . 379
2.5.1. Resting state studies . . . 379
2.5.2. Symptom provocation studies . . . 379
2.6. Personality . . . 379
3. Assessment of compulsive hoarding . . . 380
4. Treatment . . . 381
4.1. Pharmacological treatment . . . 381
4.2. Psychological treatment . . . 381
5. Discussion . . . 383
5.1. The nosological status of compulsive hoarding . . . 383
5.2. A final word on terminology . . . 383
References . . . 384

There is little doubt that saving and collecting possessions is a widespread human behavior. Most normal children have collections of some sort (Evans et al., 1997; James, 1890). For example, a cross-sectional study among parents reported that their children began to 'collect or store objects' on average from 25 to 27 months of age (Evans et al., 1997). This behavior then showed a monotonic increase, at least until the age of 6, when nearly 70% of normal children displayed this trait. This and similar studies (Zohar & Felz, 2001) have led to the speculation that this behavior is evolutionarily conserved; it is possible that during our evolutionary history there were times of great privation such that hoarding was adaptive and likely to enhance the probability of survival and reproductive success (Leckman, Mataix-Cols, & Rosario-Campos, 2005).

Like most human behaviors, saving and collecting possessions can range from totally normal and adaptive to excessive or pathological. Hoarding or compulsive hoarding are the terms more commonly used in the increasingly growing literature to refer to this excessive form of collectionism. One widely accepted definition of compulsive hoarding is the excessive collection and failure to discard objects of apparently little value, leading to clutter, distress, and disability (Frost & Hartl, 1996). In severe hoarding cases, clutter prevents the normal use of space to accomplish basic activities, such as cooking, cleaning, moving through the house, and even sleeping. Interference with these functions can make hoarding a dangerous problem, putting people at risk for fire, falling (especially elderly people), poor sanitation, and health risks (Damecour & Charron, 1998; Frost, Steketee, & Williams, 2000; Steketee & Frost, 2003; Thomas, 1997). Pathological hoarding represents a profound public health burden in terms of occupational impairment, poor physical health, and social service utilization (Tolin, Frost, Steketee, Gray, & Fitch, 2008). It also has a substantial impact on the family members (Tolin, Frost, Steketee, & Fitch, 2008).

The study of pathological or excessive hoarding behavior has received increasing attention in recent years, and its nosological status has been a matter of debate. Hoarding has often been considered a manifestation of obsessive–compulsive disorder (OCD), and the majority of the studies on hoarding have been based on this assumption. However, there is an increasing body of evidence supporting the separation of hoarding from OCD (e.g., Abramowitz, Wheaton, & Storch, 2008; Pertusa et al., 2008; Wu & Watson, 2005). Interestingly, there are no references to hoarding in the DSM-IV criteria for OCD (American Psychiatric Association, 2000); hoarding is mentioned only briefly as one of the eight diagnostic criteria for obsessive–compulsive personality disorder (OCPD). Hoarding also has been reported in individuals without OCD (e.g., Pertusa et al., 2008) and in a variety of Axis I disorders, including schizophrenia, organic mental disorders, eating disorders, brain injury, and various forms of dementia, among others. Moreover, hoarding also appears to share some similarities with impulse control disorders (ICDs), particularly compulsive buying. Previous studies on pathological hoarding behavior have varied widely from a methodological point of view and theoretical framework (i.e., they have used different diagnostic criteria, sample selection strategies, and assessment instruments), which has hindered comparisons across studies and has contributed to the confusion surrounding the concept of hoarding.

In this review, we aim to: 1) Describe the phenomenology and discuss the nosological status of hoarding, as well as its relation to OCD and other psychiatric or neurological disorders; 2) summarize the available data on the epidemiology, genetics, neuropsychology and neurobiology of pathological hoarding; 3) describe the available assessment tools for hoarding behavior; 4) review pharmacological and psychological treatments for hoarding; and 5) make recommendations for future directions in the field.

1. Phenomenology

The hallmark of hoarding is the difficulty discarding or letting go of possessions. Close inspection of the nature of items collected has revealed that hoarding individuals collect and save many different kinds of items, often filling their homes with recently purchased items that never leave their original packaging. Such objects are often mixed with trash and are frequently mistaken as worthless. For most hoarding individuals, the nature of the items saved and the reasons they give for doing so are strikingly similar to those saved by most people who do not hoard (Frost & Gross, 1993; Pertusa et al., 2008).

Severe clutter that impedes use of living spaces is the product of the excessive volume of possessions as well as the inability to effectively categorize and organize objects (Wincze, Steketee, & Frost, 2007). The resulting condition of the home can range from merely cluttered to squalid (Frost, Steketee, & Williams, 2000; Frost, Steketee, Williams et al., 2000; Steketee, Frost, & Kim, 2001). Features that contribute to the clutter and may constitute core phenomena in compulsive hoarding include indecisiveness and perfectionism (Frost & Gross, 1993; Samuels et al., 2002).

Nearly 75% of individuals who hoard engage in excessive buying, although just over half excessively acquire free things (Frost, Steketee, & Grisham, 2004; Frost, Tolin, Steketee, Fitch, & Selbo-Bruns, 2009). Anecdotal reports of stealing suggest a third form of excessive acquisition in hoarding (Greenberg, Witztum, & Levy, 1990). However, not

everyone with hoarding problems reports excessive acquisition. Ten to 20% of a large sample of hoarding individuals reported acquisition that was within one standard deviation of the non-clinical mean (Frost et al., 2009). Whereas some hoarding clients deny excessive acquisition, in many of these cases the problem surfaces later in treatment when they stop avoiding situations that trigger it. In other cases, clients who deny current acquisition problems describe such difficulties in the past.

People who hoard often appear to lack an awareness of the severity of their behavior, rationalizing their acquiring and their saving as necessary and normal and resisting attempts to intervene (Steketee & Frost, 2003). Most studies report poorer insight among hoarding compared to nonhoarding OCD patients (De Berardis et al., 2005; Frost, Krause, & Steketee, 1996; Ravi Kishore, Samar, Janardhan Reddy, Chandrasekhar, & Thennarasu, 2004; Matsunaga et al., 2002; Samuels, Bienvenu et al., 2007; Samuels, Shugart et al., 2007). Studies of informants suggest more extreme problems with insight (Tolin, Fitch, Frost, & Steketee, 2010). Elder service caseworkers reported that only 15% of their hoarding clients acknowledged the irrationality of their behavior, even though the vast majority had no significant cognitive deficits (Steketee et al., 2001). More than half of a large sample of friends and family members of people who hoard described their hoarding family member as 'having poor insight' or 'lacking insight/delusional' (Tolin, et al., 2010). Samuels, Bienvenu, et al. (2007), Samuels, Shugart, et al. (2007), reported that a greater proportion of hoarding than non-hoarding OCD patients (21% vs. 15%) were judged by the examiners to have poor insight. Not all reports of insight in hoarding have been consistent, however. Nakata et al. (2007) found hoarding to be associated with better insight in a sample of patients with OCD. Tolin, et al. (2010) reported that 85% of hoarding participants in an internet study said they would seek therapy for their hoarding if it were available, suggesting a clear recognition of the problem. The exact nature of the insight problem in compulsive hoarding is as yet unclear.

The majority of the studies assessing hoarding have been carried out in samples of patients with specific psychiatric or neurological disorders, and only a minority of studies have assessed hoarding as a behavior or trait regardless of the baseline condition or comorbidities. The following sections review the literature on the relation of hoarding with other disorders.

1.1. Obsessive–compulsive disorder

As mentioned earlier, hoarding is not listed in the DSM-IV-TR or the ICD-10 as one of the possible symptoms of OCD. However, it has long been considered an OCD symptom and features in most clinician and self-administered rating scales. Studies of clinical OCD samples indicate a frequence of hoarding in 18–40% of adults and children/adolescents (Frost et al., 1996; Mataix-Cols, Nakatani, Micali, & Heyman, 2008; Rasmussen & Eisen, 1989; Samuels et al., 2002). However, in these samples hoarding appears to be a major or primary symptom in less than 5% of cases (Mataix-Cols, Rauch, Manzo, Jenike, & Baer, 1999).

Factor and cluster analytical studies have consistently identified a separate hoarding factor in large samples of OCD patients (Bloch, Landeros-Weisenberger, Rosario, Pittenger, & Leckman, 2008; Mataix-Cols, Rosario-Campos, & Leckman, 2005). A recent meta-analysis of 21 studies involving over 5000 individuals with OCD world-wide confirmed that hoarding is an independent factor, both in adult and pediatric samples (Bloch et al., 2008). Furthermore, this meta-analysis showed that hoarding appears to be an independent factor in both English and non-English speaking countries.

Although in the above studies hoarding has been consistently identified as a 'distinct entity' within OCD, this alone does not answer the question of whether it is an OCD symptom or not. There are arguments both for and against the idea of hoarding being considered a symptom of OCD.

1.1.1. Data that support that hoarding may be a symptom of OCD

Phenomenologically, compulsive hoarding resembles OCD in that the avoidance and difficulties discarding possessions are driven by fears of losing important items that the patients feel they may need in the future or feel emotionally attached to, or fears of making mistakes regarding what to keep or discard. These fears could be regarded as functionally similar to 'obsessions', and the avoidance and urges to save items similar to 'compulsions'. Several studies in non-clinical samples have observed significant correlations (ranging from .4 to .5) between measures of hoarding and OCD symptoms assessed by self-report and the Yale-Brown Obsessive Compulsive Scale (Y-BOCS) interview (Coles, Frost, Heimberg, & Steketee, 2003; Frost & Gross, 1993; Frost et al., 1996). Community hoarding samples (i.e., people who self-identified as having hoarding problems) report more symptoms of OCD compared to nonclinical controls and experience them as more severe and distressing, suggesting a link between OCD and hoarding in people who hoard (reviewed by Steketee & Frost, 2003). However, given that the presence of comorbid OCD in the hoarding group was not specifically assessed in either of these studies, these results could also be explained by the presence of a significant proportion of patients with a comorbid OCD among the hoarding groups, considering the fact that subsequent studies have found OCD to be present in at least one-third of individuals with severe hoarding (Frost, Steketee, Williams, & Warren, 2000; Pertusa et al., 2008).

Among clinical samples selected via the Y-BOCS checklist and a screening interview, OCD participants with and without hoarding symptoms did not differ in severity of OCD symptoms (according to the Y-BOCS and Padua Inventory), and both groups scored higher than anxious patients and controls (Frost, Steketee, & Williams, 2000; Frost, Steketee, Williams et al., 2000). Furthermore, patients with hoarding did not differ from the non-hoarding ones on the number of OCD symptoms reported on the Y-BOCS Symptom Checklist.

1.1.2. Data that support that hoarding may not be a symptom of OCD

Although phenomenologically, fears of losing things resemble obsessions and avoidance and urges to save items resemble compulsions, there are a number of important differences between compulsive hoarding and OCD. First, individuals with compulsive hoarding do not experience ego-alien intrusive thoughts or images about possessions that urge them to perform a ritual (Pertusa et al., 2008). Hoarding is rather a passive phenomenon whereby intense distress is triggered only when the sufferers face the prospect of having to discard their possessions. In our clinical experience, when directly confronted with having to discard one of their possessions, individuals who hoard are more likely to experience grief or sometimes anger, rather than anxiety. In contrast, OCD patients always report intense anxiety when being confronted with situations they would rather avoid (e.g., dirt or germs). In hoarding, distress and disability often appear late in the course of the syndrome and are usually linked to the intervention of third parties like relatives or local authorities. Second, the ego-syntonic nature of hoarding symptoms and lack of insight contrasts with typical OCD symptoms (Steketee & Frost, 2003). Indeed, at least early in the course of the problem, the acquisition of possessions is often an ego-syntonic – even pleasurable – experience, rather than an anxiety-reducing one.

Another argument against the idea of hoarding as a symptom of OCD is the observation that a substantial number of individuals with severe hoarding do not display other OCD symptoms. For example, in one study 33% of 70 severe hoarding participants did not have any significant OCD symptoms (Frost, Steketee, & Williams, 2000; Frost, Steketee, Williams et al., 2000). In a sample of 104 patients diagnosed with significant hoarding problems and generated by community solicitation, only 17% were diagnosed with OCD (based on non-hoarding symptoms), whereas the comorbidity rates with major depression, social phobia and GAD were 57%, 29% and 28%, respectively (Frost, Steketee, Tolin, & Brown, 2006). In a recent

epidemiological study of compulsive hoarding, none of the participants classified as 'hoarders' met diagnostic criteria for OCD (Samuels et al., 2008).

A recent study by Pertusa et al. (2008) further examined this question by recruiting and comparing severe hoarding individuals with and without OCD. The authors recruited OCD patients with prominent hoarding symptoms ($n=25$), severe hoarding individuals without OCD ($n=27$), OCD patients without hoarding ($n=71$), anxious controls ($n=19$), and community controls ($n=21$). Compulsive hoarding was defined using criteria based on Frost and Hartl (1996) and Grisham, Brown, Savage, Steketee, and Barlow (2007): 1) acquisition of, and failure to discard a large number of possessions; 2) living spaces sufficiently cluttered so as to preclude activities for which those spaces were designed; 3) significant distress or impairment in functioning caused by the hoarding; 4) clutter persisting for at least six months, and 5) hoarding behaviors not better accounted for by another mental disorder (e.g., dementia, bipolar disorder, major depressive disorder). In addition, individuals with severe hoarding had to score 40 or higher on the Saving Inventory-Revised (Frost et al., 2004). Participants fulfilling these criteria were then further divided into two groups according to the presence/absence of a DSM-IV diagnosis of OCD. Individuals with severe hoarding were diagnosed as having OCD only if they endorsed other prototypical OCD symptoms, or had obsessions/compulsions as defined in the DSM-IV (intrusive thoughts, images or impulses that are anxiety provoking; repetitive behaviors or mental acts that the person feels driven to perform in response to an obsession). The results indicated that the phenomenology of hoarding behavior was largely similar in the two hoarding groups. The majority of participants in both hoarding groups reported hoarding similar types of items and for strikingly similar reasons (i.e., their emotional or intrinsic value). Even in most patients with OCD, their hoarding was clearly unrelated to other 'traditional' OCD themes, suggesting that the two phenomena are independent. Another key finding of the study by Pertusa et al. (2008) was that about one-fourth of severe hoarding individuals with OCD (which represented approximately 12% of the overall sample of hoarding individuals) showed a somewhat different psychopathological profile, characterized by hoarding of bizarre items (such as rotten food, bodily products, etc.), and presence of other obsessions/compulsions related to their hoarding, such as fear of catastrophic consequences, fear that other people may become contaminated if items are discarded, checking, and need to perform mental compulsions when discarding any item (Pertusa et al., 2008). The authors concluded that in most cases (88% of individuals in their sample; $n=52$) compulsive hoarding is a separate condition, which can co-occur with OCD as well as with other psychiatric disorders. They also suggest that it may be possible that, in a minority of cases, hoarding behaviors can occur as a consequence of other traditional OCD symptoms.

Finally, several recent studies (e.g., Abramowitz et al., 2008; Olatunji, Williams, Haslam, Abramowitz, & Tolin, 2008; Pertusa et al., 2008; Samuels et al., 2008; Wu & Watson, 2005) have argued against the conceptualization of hoarding as a symptom of OCD. These studies have found that correlations between hoarding and other prototypical OCD symptoms are typically in the small to moderate range, comparable to correlations with other non-OCD measures like anxiety and depression. By contrast, other prototypical OCD symptoms show stronger inter-correlations. For example, Abramowitz et al. (2008) recruited samples of OCD patients ($n=225$), patients with other anxiety disorders ($n=178$) and a group of unscreened undergraduate students ($n=1{,}005$) and found that hoarding tended to correlate more weakly with other OCD symptoms than these other symptoms inter-correlated, and that hoarding symptoms were not correlated with global OCD or anxiety severity, whereas other OCD symptoms were.

Taken together, these studies challenge the idea of a specific OCD-hoarding relation. Rather, the data available to date suggest that, in most cases, compulsive hoarding may be better conceptualized as a separate syndrome, which shows high comorbidity with OCD as well as with other emotional disorders (see comorbidity section below). It also appears that, in a minority of cases, severe hoarding behavior can be a consequence of other OCD symptoms.

1.2. Obsessive–compulsive personality disorder (OCPD)

Hoarding is listed as one of the eight diagnostic criteria for OCPD (American Psychiatric Association, 2000) and it has its origins in the psychoanalytical clinical descriptions of the 'anal' character (Grilo, 2004). There are at least three relevant questions about the relation between hoarding and OCPD.

1.2.1. Does the hoarding criterion 'belong' with the other OCPD criteria?

Grilo (2004) reported modest inter-correlations (ranging from .35 to .62) between the eight OCPD criteria in a sample of 211 outpatients with binge eating disorder. The hoarding criterion showed some of the smallest correlations (ranging from .19 to .28) with the remaining OCPD criteria. Furthermore, in a principal components analysis the hoarding ('packrat') criterion loaded on a separate factor, together with the miserliness item (Grilo, 2004). Although these three factors were inter-correlated, the rigidity and perfectionism factors showed stronger inter-correlations ($r=.51$) than either of them with the hoarding/miserliness factor ($r=.27$ and $r=.35$, respectively). A subsequent confirmatory factor analysis compared the two and three factor solutions in a large sample of 263 patients with binge eating disorder (Ansell, Pinto, Edelen, & Grilo, 2008). The authors found support for both factor solutions but suggested that miserliness and hoarding criteria may be less indicative of OCPD and the construct may improve with their exclusion.

Hummelen, Wilberg, Pedersen, and Karterud (2008) examined data from a large sample of 2237 patients from the Norwegian Network of Psychotherapeutic Day Hospitals, which specialized in the treatment of personality disorders. They found modest reliability for OCPD and weak correlations between the hoarding criterion and the other OCPD criteria. Exploratory and confirmatory principal components analyses did not replicate the 3-factor structure reported by Grilo (2004) but, crucially, the hoarding criterion did not significantly load on any of the resulting factors in either exploratory or confirmatory analyses. The authors concluded that the overall validity of the OCPD construct could be improved by the removal of the hoarding and miserliness criteria (Hummelen et al., 2008).

Taken together, the existing data suggest that the hoarding criterion sits rather uncomfortably among the other OCPD criteria. It also is questionable as to what extent the current definition of hoarding in the OCPD criteria (i.e., focusing on non-sentimental worthless objects) actually fits most cases of hoarding that are seen clinically. Sentimental saving has also been reported (Frost, Hartl, Christian, & Williams, 1995; Steketee & Frost, 2003), and it appears that hoarding individuals save everything, including worthless and valuable objects. Thus, there is a case for excluding hoarding from the OCPD criteria. In fact, the ICD-10 already excludes the hoarding and miserliness criteria from its OCPD-equivalent diagnosis, Anankastic Personality Disorder (World Health Organization, 1992).

1.2.2. Is compulsive hoarding associated with an increased risk for OCPD?

There are several clinical OCD studies that have examined the relation between the hoarding items of the Yale-Brown Obsessive–Compulsive Scale Symptom Checklist (Y-BOCS-SC) and the presence of personality disorders, including OCPD. Hoarding was consistently associated with increased prevalence of several personality disorders (e.g., Frost, Steketee, & Williams, 2000; Frost, Steketee, Williams et al., 2000; Mataix-Cols, Baer, Rauch, & Jenike, 2000; Samuels, Bienvenu et al., 2007; Samuels, Shugart et al., 2007; Pertusa et al., 2008).

Regarding OCPD, several – but not all (see Winsberg, Cassic, & Koran, 1999) – of these studies showed that the presence of hoarding

symptoms in OCD was associated with increased frequency of OCPD, even when the hoarding criterion was removed from the analyses (Mataix-Cols et al., 2000; Samuels, Bienvenu et al., 2007; Samuels, Shugart et al., 2007). This would suggest an association between hoarding symptoms and the remaining OCPD criteria. However, it is important to note the limitations of these studies. First, they recruited samples of OCD patients rather than compulsive hoarding individuals. Second, hoarding was categorically ascertained with two items of the Yale-Brown obsessive–compulsive scale checklist (Y-BOCS-SC), which does not capture the different features of the syndrome (i.e., clutter, acquisition, distress, interference, etc.) and thus may provide inadequate assessment of the severity of compulsive hoarding.

Only two studies to date specifically recruited severe hoarding individuals and examined the association between hoarding and OCPD. Frost, Steketee, Williams et al. (2000) compared OCD patients with prominent hoarding symptoms ($n=37$), non-hoarding OCD patients ($n=20$), anxious controls ($n=13$) and community controls ($n=34$). They found that, after excluding the OCPD hoarding criterion, patients with OCD and severe hoarding reported equivalent levels of OCPD symptoms than the other patient groups. In another study by Pertusa et al. (2008), the number of endorsed OCPD criteria was comparable in OCD patients with prominent hoarding symptoms, severe hoarders without OCD, OCD patients without hoarding, and anxious controls. Thus, the specific association between compulsive hoarding (regardless of whether it occurs with or without OCD) and OCPD could be entirely explained by the overlapping item content. This further supports the independence of compulsive hoarding from OCPD.

1.2.3. What is the relation between the hoarding criterion of OCPD and OCD?

Samuels et al. (2008) examined data from an epidemiological study of personality disorders in the Baltimore area ($n=742$). Based on the OCPD hoarding criterion, they estimated the prevalence of compulsive hoarding to be 4% (5% weighted) of the population. Crucially, they found that none of the individuals classified as 'hoarders' met diagnostic criteria for OCD. Conversely, none of the 13 participants who were diagnosed with OCD had pathological hoarding, although 4 of these patients had sub-threshold hoarding behavior.

In the study by Hummelen et al. (2008), although OCPD was associated with OCD (18% of OCPD patients had OCD and 24% of OCD patients had OCPD), and several OCPD criteria were associated with OCD, the hoarding criterion was not. Instead, hoarding was associated with paranoid and dependent personality disorders. However, another study did find that the hoarding criterion of OCPD was significantly more frequent in patients with OCD than in patients with other emotional disorders (Eisen et al., 2006). It is important to notice that in all these studies hoarding was assessed with a single item and that it is therefore unclear whether individuals endorsing the hoarding criterion have clinically significant hoarding problems.

1.3. Brain lesions

Several case studies report on patients who started hoarding after suffering brain lesions, and suggest that the anterior ventromedial prefrontal and cingulate cortices are somehow implicated in abnormal hoarding behavior (Anderson, Damasio, & Damasio, 2005; Cohen, Angladette, Benoit, & Pierrot-Deseilligny, 1999; Hahm, Kang, Cheong, & Na, 2001; Volle, Beato, Levy, & Dubois, 2002). However, the psychological and neural mechanisms involved in compulsive hoarding and hoarding in the context of brain lesions may be completely different. In fact, according to the few phenomenological descriptions provided in the literature, the hoarding behavior in brain lesion patients appears to be more purposeless (Anderson et al., 2005; Cohen et al., 1999; Hahm et al., 2001; Volle et al., 2002), as opposed to hoarding in the context of compulsive hoarding, in which virtually all patients report specific reasons – usually emotional attachment or attribution of high intrinsical value to their possessions – as the main motivations for their hoarding behavior.

1.4. Dementia

Hoarding behavior – often associated with hiding and rummage – is a common symptom in patients with moderate-to-severe dementia. In a study comprising 133 patients with dementia admitted to a geropsychiatric ward, 30 (22.6%) exhibited hoarding behavior (Hwang, Tsai, Yang, Liu, & Lirng, 1998), which was associated with a higher prevalence of repetitive behaviors, hyperphagia and pilfering. In some patients, hoarding preceded the disease onset, initially in an organized fashion, which eventually became disorganized as their dementia progressed (Homma, Ishii, & Niina, 1994). However, other researchers have not found a link between cognitive decline and hoarding. For instance, Hwang et al. (1997, 1998) found no correlation between hoarding behavior and Mini-Mental State Examination (MMSE) score in nursing home residents. In another study that included nursing home residents ($n=408$) and community-dwelling senior day-care participants ($n=177$), 15% of the nursing home residents and 25% of the community-dwelling senior day-care participants manifested hoarding behavior several times a week or higher (Marx & Cohen-Mansfield, 2003). Hoarding behavior described in these patients – which consisted mainly in collecting many or inappropriate objects such as food in one's purse, pockets, or drawers and/or hiding the collected items – is certainly different from the typical behavior of 'hoarders' defined by Frost and Hartl (1996). Interestingly, elderly persons who manifested hoarding behavior were those with relatively fewer health and functional disabilities, and those who exhibited hoarding behavior also manifested agitated behaviors as well as a larger appetite. It is nonetheless conceivable that some of these elderly persons hoarded across their lifetimes, such that dementia aggravated rather than initiated the hoarding behavior. Thus, longitudinal studies are needed to clarify the nature of the relation between compulsive hoarding and dementia.

1.5. Diogenes syndrome

Some hoarding cases are characterized by 'squalid' or unsanitary conditions. Squalor has been defined in various ways including, 'social breakdown of the elderly', 'Diogenes syndrome' and 'severe domestic squalor' (Snowdon, Shah, & Halliday, 2007). These definitions have usually encompassed both domestic neglect and a lack of personal hygiene (Clark, Mankikar, & Gray, 1975; Macmillan & Shaw, 1966; Shah, 1990). The majority of case observations and studies on squalor have focused on elderly populations recruited from nursing or disability services (Snowdon et al., 2007). These studies initially suggested that those living in squalor were likely to be over the age of 60, primarily female, living alone and unmarried (Shah, 1990). Hypotheses on the etiology of squalor have moved from the phenomenon possibly being uni-dimensional to having heterogeneous causes such as physical disabilities, brain damage, psychiatric conditions, and personality disorders (Snowdon et al., 2007). A study on squalor reported the prevalence to be 0.005% in the United Kingdom (Shaw & Shah, 1996). Studies on squalor have almost always noted presence of hoarding behaviors. Macmillan and Shaw (1966) reported squalor patients' reluctance to throw things away. Clark et al. (1975) observed hoarding of useless items and severely diminished living space for several of their squalor cases. Snowdon (1987) provided data indicating that 72% of cases were rated as 'hoarding a lot' or 'possessions piled high.' However, none of these studies formally assessed the presence of hoarding, and participants in these studies were not recruited based on a primary diagnosis of compulsive hoarding.

On the other hand, research on hoarding has rarely included assessments of severe domestic squalor. Winsberg et al. (1999) noted

that clutter inhibited normal activities of daily living — including personal hygiene. A few studies have provided more direct indications of squalor in hoarding. Frost, Steketee, Williams et al. (2000) surveyed health department officers in Massachusetts who reported that 38% of their hoarding cases were 'heavily cluttered with filthy environment, overwhelming'. Steketee et al. (2001) focused on cleanliness ratings of the personal appearance and the homes of 62 elderly hoarding individuals. In their sample, 17% of individuals were described as 'extremely filthy' and 33% of residences were rated as 'extremely filthy and dirty'. For 32% of the residences, there was an overpowering odor from rotten food or animal or human feces. Many subjects could not use their refrigerator (45%), kitchen sink (42%), bathtub (42%), or toilet (10%).

Lack of standardized instruments to measure squalor have prevented researchers from understanding squalor in compulsive hoarding. In response to these concerns, (Rasmussen, Steketee, Tolin, Frost, & Brown, submitted for publication) created a measure of squalor – the Home Environment Index (HEI) – suitable for use with hoarding cases. The HEI is a self-report measure containing items pertaining to squalor in hoarding, including questions on domestic conditions and personal care. The measure was developed based on the squalor and activities of daily living literature as well as anecdotal accounts of squalid conditions in compulsive hoarding. An administration of this instrument in an Internet sample of 793 individuals who identified their primary psychiatric problem as compulsive hoarding allowed for an examination of the scale across replication samples. Exploratory and subsequent confirmatory factor analyses revealed a single 15 item factor. Internal reliability for the scale was high (Cronbach's alpha = .89). Confirmatory Factor Analysis (CFA) models using the replication sample revealed that, as predicted from the measurement model, the HEI correlated more strongly with measures of hoarding than with measures of OCD symptoms such as washing and checking, and than it did with measures of depression, anxiety and stress (Rasmussen et al., submitted for publication).

At present, available data are too scarce to draw any solid conclusions about the nosological status of the clinical picture commonly known as Diogenes syndrome and its relation with compulsive hoarding. However, clearly the great majority of subjects with pathological hoarding behavior described in the literature on compulsive hoarding did not exhibit the core features of Diogenes syndrome – i.e., self-neglect and squalor – suggesting that these clinical presentations may represent different constructs. Longitudinal studies will help learn about the natural history of both compulsive hoarding and Diogenes syndrome and evaluate a possible link, if any, between these conditions.

1.6. Animal hoarding

Animal hoarding has been defined as the accumulation of a large number of animals and: 1) Failure to provide minimal standards of nutrition, sanitation, and veterinary care; 2) failure to act on the deteriorating condition of the animals (including disease, starvation or death) and the environment (severe overcrowding, extremely unsanitary conditions); and often, 3) lack of awareness of the negative effects of the collection on their own health and well-being and on that of other family members (Frost, Steketee, & Williams, 2000; Frost, Steketee, Williams et al., 2000; Reinisch, 2008; Patronek & Nathanson, 2009). Severe domestic squalor has also been observed within the context of animal hoarding. Patronek and Nathanson (2009) investigated 49 animal hoarding living areas; 78% were 'heavily littered with trash and garbage,' and in 45% there was 'profuse urine or feces in the living spaces'. Frost, Steketee, and Williams (2000), found animal hoarding cases to involve significantly less sanitary conditions than hoarding that does not involve animals.

A unique aspect of animal hoarding is its ethical implications in that it may involve cruelty to animals. Ascione (1993) defines cruelty to animals as a 'socially unacceptable behavior that intentionally causes unnecessary pain, suffering, or distress to and/or death of an animal' (p. 228). Given that animal cruelty can include acts of commission and omission, hoarding that involves animal neglect could be considered a form of cruelty to animals (Ascione, Thompson, & Black, 1997).

Some authors have proposed that animal hoarding be considered a special manifestation of compulsive hoarding (e.g., Kuehn, 2002; Patronek & Nathanson, 2009), given that most individuals with animal hoarding also hoard inanimate objects (Patronek & Nathanson, 2009). On the other hand, some of the key phenomenological features of animal hoarding — such as neglect and lack of awareness of the negative effects of the collection on their own health and well-being and on that of other family members — are similar to those found in Diogenes syndrome. Steketee, Gibson, Frost, Alabiso, Arluke, et al., (submitted for publication) completed a qualitative study comparing 16 animal hoarders to 11 controls who owned large number of animals that were adequately cared for, and found that the differences between groups focused mainly on problems with early attachments, and chaotic childhood home environments, as well as attributions of human qualities to animals. Further studies are needed to address this issue.

1.7. Developmetal and genetic disorders

Hoarding, as well as other repetitive behaviors, occurs frequently in people with autism spectrum disorders (ASD), including Asperger syndrome, autism and atypical autism (Bejerot, 2007; McDougle et al., 1995; Russell, Mataix-Cols, Anson, & Murphy, 2005). Whether hoarding in this group is linked with the 'special interests' domain of ASD, with a comorbid OCD, or represents a standalone problem is currently unknown.

Hoarding behaviors also have been reported in several genetic syndromes, including Prader-Willi syndrome (PWS) and Velocardiofacial (22q11 Deletion) syndrome (VCFS). Prader-Willi syndrome is a rare genetic disorder, in which a subset of genes on chromosome 15 are missing or unexpressed (15q partial deletion) on the paternal chromosome. One of the most prominent features of PWS is the presence of hyperphagia and food-seeking behavior such as food foraging and hoarding (Holm et al., 1993). Dykens, Leckman, and Cassidy (1996) assessed non-food obsessions and compulsions in 91 patients with PWS (mean age 19 years). Prominent symptoms, seen in 37–58% of the sample, included hoarding; ordering and arranging; concerns with symmetry and exactness; rewriting; and needs to tell, know or ask. The authors also compared them with age-and sex-matched adults with OCD who were not cognitively impaired, and concluded that the PWS and OCD groups showed similar levels of symptom severity and numbers of compulsions, and that they also showed more areas of symptom similarity than difference. Velocardiofacial syndrome is a disorder caused by the deletion of a small piece of chromosome 22. The features of this syndrome may include birth defects (such as congenital heart disease), learning disabilities, recurrent infections, and psychiatric illnesses such as schizophrenia. Gothelf et al. (2004) evaluated prevalence of psychiatric disorders, especially OCD, in 43 patients with VCFS and a mean age of 18 years (SD 10), and found that 32.6% met DSM-IV criteria for OCD. Hoarding (which was considered a symptom of OCD in this study) was present in approximately one-third of these. It has been suggested that VCFS might share some common symptoms with subjects with pervasive developmental disorder (PDD) (Niklasson, Rasmussen, Oskarsdottir, & Gillberg, 2002).

Research is clearly needed to understand the precise phenomenology and reasons for hoarding in these syndromes.

1.8. Schizophrenia

Traditionally, schizophrenia has been listed as one of the possible conditions related to hoarding behavior. In the study by Luchins,

Goldman, Lieb, and Hanrahan (1992), hoarding was described as a 'repetitive dysfunctional behavior' (together with polydipsia, bulimia, and mannerisms), and was mainly observed in schizophrenic patients who were chronically institutionalized. Tracy et al. (1996) assessed nine repetitive behaviors from the Elgin Behavioral Rating Scale in 400 patients with schizophrenia residing at a state hospital. A principal components analysis suggested a five-factor model, and one of the factors was 'bizarre use of objects, bizarre grooming and hoarding'.

Stein, Laszlo, Marais, Seedat, and Potocnik (1997) found that 5 out of 100 consecutive patients admitted to a geriatric psychiatry inpatient unit presented clinically significant hoarding. Of these patients, four met diagnostic criteria for paranoid schizophrenia. The fifth patient met criteria for bipolar disorder (manic episode) and also had symptoms of dementia. Interestingly, three of these five patients responded to antipsychotic medication.

Wustmann and Brieger (2005) assessed 35 individuals who lived in squalor and filth or in a neglected condition or who were known to hoard. Of these, 17 (49%) suffered from an organic brain disease, and 14 (40%) fulfilled criteria for psychotic illness (mainly schizophrenia). Eleven months after the initial assessment, 21 patients (60%) had not improved their neglect, squalor or hoarding, which was especially true for persons suffering from a psychotic illness.

Thus, descriptions in the literature of hoarding behavior displayed by patients with schizophrenia are scarce, and refer mainly to hoarding as a repetitive behavior or in the context of a broader clinical picture including delusions, self-neglect, and squalor — reminiscent of Diogenes syndrome. Although clearly more research is needed, hoarding in the context of schizophrenia appears to be phenomenologically different from the clinical picture described by Frost and Hartl (1996). Anecdotal evidence also suggests that some of these cases could be effectively managed with antipsychotic medication.

1.9. Impulse control disorders

There also seems to be a link between compulsive hoarding and impulse control disorders (ICDs) although the evidence so far is preliminary. The observed egosyntonic nature of some features of hoarding suggests an association, and several empirical investigations have connected hoarding and ICDs (Steketee & Frost, 2003).

Many hoarders feel compelled to collect or acquire free items, as well as to buy excessively (Frost et al., 2009). Nearly 75% of hoarders engage in excessive buying while just over half excessively acquire free things (Frost et al., 2004, 2009). However, not everyone with hoarding problems reports excessive acquisition. For example, 10 to 20% of a large sample of hoarders reported acquisition that was within one standard deviation of the non-clinical mean (Frost et al., 2009).

Conversely, high rates of compulsive hoarding have been described in samples of compulsive buyers (Mueller et al., 2007). In the study of Mueller et al. (2009) described in the Epidemiology section below, significant correlations were found between the compulsive hoarding and the compulsive buying measures, and about two-thirds of participants classified as having compulsive hoarding were also deemed as suffering from compulsive buying. In addition, some research suggests that beliefs about possessions and about buying are similar to beliefs of those with compulsive hoarding (Kyrios, Frost, & Steketee, 2004).

Samuels et al. (2002) reported a greater frequency of trichotillomania and skin picking, among OCD patients with hoarding compared to non-hoarding OCD patients. Also, Frost, Meagher, and Riskind (2001) reported high levels of hoarding symptoms in a sample of pathological gamblers.

An association between kleptomania and compulsive buying has also been proposed (Fishbain, 1994), and anecdotal experience gathered by Steketee and Frost (2003) suggests a link between kleptomania and compulsive hoarding but clearly more research is needed. Steketee and Frost (2003) speculated that perhaps compulsive hoarding is part of a broader category of disorders that are psychopathologies of acquisition including hoarding, buying, and kleptomania.

Taken together, these data provide preliminary evidence that hoarding may have close ties with the impulse control disorders, particularly copulsive buying. However, further research is needed to clarify this relation.

2. Recent advances in hoarding research

2.1. Epidemiology

Recent studies suggest that hoarding is much more frequent in the population than previously thought (see Table 1). In the National Comorbidity Survey Replication (NCS-R), a nationally representative survey of US adults, 14% of participants had lifetime prevalence of hoarding symptoms (Ruscio, Stein, Chiu, & Kessler, 2008). However, the parallel European study, which used a similar instrument to the NCS-R (see footnote in Table 1), found a much lower lifetime prevalence of hoarding (2.6%). Interestingly, in the latter study, the prevalence of hoarding was 2% among individuals with no mental disorders, although OCD could not be assessed (Fullana et al., in press). Samuels et al. (2008) estimated the lifetime prevalence of hoarding in 742 participants (ages 34–94 years) in the Hopkins Epidemiology of Personality Disorder Study. Prevalence of hoarding was nearly 4% (5.3%, weighted), and increased with age, was inversely related to household income, and was twice as great in men than women. Crucially, as mentioned earlier, none of these participants met criteria for OCD. Participants with hoarding had a greater lifetime prevalence of alcohol dependence. The odds of hoarding increased with the number of paranoid, schizotypal, avoidant, and obsessive–compulsive traits, even after statistically controlling for alcohol dependence. Mueller, Mitchell, Crosby, Glaesmer, and de Zwaan (2009) used the German version of the Saving Inventory-Revised to

Table 1
Epidemiological studies on hoarding.

Study	Instrument	Sample size	Prevalence (%)	Comments
Ruscio et al. (2008)	CIDI 3.0 (1 hoarding item)	2,073	14 (lifetime)	National Comorbidity Survey Replication (NCS-R)
Samuels et al. (2008)	Hoarding criterion for obsessive–compulsive personality disorder	742	4 (lifetime) 5.3 (weighted)	Hopkins Epidemiology of Personality Disorder Study
Mueller et al. (2009)	German version of the Savings Inventory-Revised (self-report)	2,307	4.6 (point)	Representative sample of the German general population
Iervolino et al. (2009)	Hoarding Rating Scale-Self Report (HRS-SR)	5,022	2.3 (point)	Twin pairs from the UK Adult Twin Register (TwinsUK)
Fullana et al. (in press)	CIDI 3.0 (1 hoarding item)*	2,804	2.6 (lifetime) 2.0 in individuals with no mental disorders ($n = 1285$)	European Study of the Epidemiology of Mental Disorders (ESEMeD)

Abbreviations: CIDI (World Mental Health Composite International Diagnostic Interview). * The wording of the questions related to OC symptoms in the NCS-R and ESEMeD studies were identical except for hoarding. Participants in the NCS-R were asked about "A compulsion to save things or being unable to throw things away that you no longer need", i.e., both hoarding obsessions and compulsions were assessed. In the ESEMeD study only hoarding compulsions were assessed ("A compulsion to save things or hoard things").

assess the prevalence rate of compulsive hoarding as well as its association with compulsive buying in a nationally representative sample of the German population ($n = 2{,}307$). The point prevalence of compulsive hoarding was estimated to be 4.6%.

A recent study by Iervolino et al. (2009) assessed the presence of hoarding in a sample of 5022 twins from the general population by means of a self-report version of the Hoarding Rating Scale-Interview (HRS-I; Tolin, Frost, & Steketee, in press), a brief interview for assessing compulsive hoarding. In total, 2.3% of the whole sample reported symptoms severe enough to indicate caseness (i.e., achieved a score greater than 17 on the HRS-SR).

Of note, two of these epidemiological studies (Samuels et al., 2008; Iervolino et al., 2009) have reported a significantly greater prevalence among men, and the third study (Mueller et al., 2009) did not find differences between men and women. However, clinical hoarding samples are almost invariably predominantly female (Steketee & Frost, 2003). A possible explanation may be that women are more likely to acknowledge or seek help about their hoarding problems. The actual prevalence of compulsive hoarding as a syndrome is unknown and will remain so until a set of consensuated diagnostic criteria are agreed.

2.2. Family, twin, and molecular genetic studies

Frost and Gross (1993) reported that 25 of 32 (78%) individuals with compulsive hoarding reported that they had first-degree relatives who were 'pack rats'. Winsberg et al. (1999) found that 84% of 20 OCD patients with hoarding symptoms reported a family history of hoarding, and 80% grew up in a household where someone else hoarded. Pertusa et al. (2008) found that approximately 50% of severe hoarders (regardless of whether they had OCD or not) had a first degree relative with hoarding difficulties. In the Johns Hopkins OCD Family Study, hoarding symptoms were diagnosed in 12% of first-degree relatives of hoarding probands, compared to 3% of relatives of non-hoarding probands (Samuels et al., 2002). In the OCD Collaborative Genetics Study (OCGS), the proportion with hoarding symptoms among relatives (mostly siblings) with OCD was greater in those with hoarding than non-hoarding probands. In addition, the sib-sib intraclass correlation of scores on the hoarding factor dimension was .21 (Hasler et al., 2007), when using the Y-BOCS symptom categories, and .24 ($p = .002$) when using dichotomous factor analysis on symptoms, larger than for any of the other OC symptom factors (Pinto et al., 2008). In the only twin study of compulsive hoarding, Iervolino et al. (2009) found that genetic factors account for approximately 50% of the variance of compulsive hoarding, with non-shared environment and measurement error accounting for the other half. Recent studies have suggested a possible association between traumatic life events and the onset and severity of compulsive hoarding (Cromer, Schmidt, & Murphy, 2007; Hartl, Duffany, Allen, Steketee, & Frost, 2005). Although it is possible that nonshared environmental influences reflect negative life events, further research exploring putative environmental risk factors is clearly needed. Only a few studies have examined the molecular genetics of compulsive hoarding in the context of other syndromes. A genome-wide scan in sibling pairs with Tourette's syndrome (TS) found that the hoarding phenotype was associated with markers on chromosomes 4q, 5q and 17q (Zhang et al., 2002). In a sample of OCD patients of Afrikaner descent, Lochner et al. (2005) found that the catecholamine-O-methyl-transferase (COMT) gene on chromosome 22q11.21 might contribute to the genetic susceptibility to hoarding. The OCD Collaborative Genetics Study found suggestive linkage of compulsive hoarding to a marker on chromosome 14q in multiplex families with OCD (Hasler et al., 2007; Samuels, Bienvenu et al., 2007; Samuels, Shugart et al., 2007). Alonso, Gratacos, et al. (2008) reported that the neurotrophic tyrosine kinase receptor type 3 (NTRK3) gene on chromosome 15q25.3 may contribute to the genetic susceptibility to hoarding in OCD. A recent case-control study with 325 OCD probands (Wendland et al., 2009) found significant association between a single nucleotide polymorphism (SNP) correlating with SLCA1 (which encodes the neuronal glutamate transporter) gene expression and the hoarding subphenotype as assessed by the Y-BOCS and the Saving Inventory-Revised (SI-R). The association with SI-R scores appeared to be largely driven by the acquisition subscale, as the association was less strong with the clutter and difficulty discarding subscales.

To summarize, although research using a blind family study methodology is lacking, the available data indicate that hoarding is a robustly familial condition. A twin study has shown that familiality appears to be mainly due to genetic factors, at least in women, although non-shared environmental influences are also likely to be important. Molecular genetic studies have so far been conducted in the context of other syndromes (i.e., TS, OCD) rather than compulsive hoarding *per se*, and have been inconsistent.

2.3. Neuropsychology

A small number of studies has begun to examine neuropsychological function in compulsive hoarding. Hartl et al. (2004) found that severe compulsive hoarding individuals ($n = 22$, 4 of whom met criteria for OCD) had poorer delayed visual and verbal recall and used less effective organizational strategies for visual recall compared with 24 healthy controls. These individuals also reported significantly less confidence in their memory and agreater level of worry concerning the potentially catastrophic consequences of forgetting. Importantly, the resultsremained significant after the exclusion of the four participants who also met criteria for OCD (Hartl et al., 2004).

In another study, OCD patients with prominent hoarding symptoms ($n = 10$) showed impaired performance and blunted skin conductance responses during the Iowa Gambling Task (IGT), whereas non-hoarding OCD patients showed normal performance (Lawrence et al., 2006). However, Grisham et al. (2007) did not replicate these findings, as hoarding individuals had an equivalent performance on the IGT compared to non-hoarding OCD patients and healthy controls. It is important to note that individuals in Grisham's study reported hoarding as their principal (and in some cases only) OCD symptom, whereas Lawrence et al. (2006) selected a subgroup of patients with additional hoarding symptoms from a group of patients diagnosed with OCD. Grisham et al. (2007) speculate that 'it is possible that patients whose primary psychiatric symptom is compulsive hoarding have a somewhat different etiology and clinical presentation than OCD patients with additional hoarding symptoms' (p. 1480).

Grisham et al. (2007) studied a group of patients with compulsive hoarding ($n = 30$) and compared the results with a mixed clinical group ($n = 30$) and a nonclinical community group ($n = 30$). The hoarding patients demonstrated slower and more variable reaction time, increased impulsivity, greater difficulty distinguishing targets and non-targets, and poorer spatial attention relative to comparison groups. Multiple regression analyses demonstrated that slower reaction time and increased impulsivity were significantly related to hoarding symptoms after controllling for the effect of depression, schizotypy, and OCD symptoms.

It is difficult to draw firm conclusions from these preliminary reports. As in other domains reviewed, comparison across studies is hindered by methodological differences. Specifically, whereas some studies recruited OCD patients with hoarding symptoms (with different degrees of severity) who were assessed generally with the Y-BOCS-SC, in other studies the hoarding group was composed of severe hoarding individuals who in most cases did not meet criteria for OCD. Neuropsychological investigations comparing hoarding individuals with and without OCD are needed.

2.4. Animal and human lesion studies

The neural substrates of hoarding behavior have been well studied in animals that naturally display hoarding behaviors as part of their

behavioral repertoire (e.g., rodents, birds), as well as primates. These studies clearly implicate subcortical limbic structures (nucleus accumbens, ventral tegmental area, amygdala, hippocampus, thalamus, hypothalamus) and the ventro-medial prefrontal cortex in the mediation of hoarding behavior. For example, electrical stimulation of lateral hypothalamus (a region that also promotes feeding) increases hoarding behavior in rats (Herberg & Blundell, 1967). The animal literature also suggests that the dopaminergic system plays a crucial role in hoarding behavior. For example, neonatal depletion of dopaminergic meso-cortical projections decreases hoarding in rats (Kalsbeek, De Bruin, Feenstra, Matthijssen, & Uylings, 1988), and hoarding behavior can be restored to control levels in dopamine-lesion rats by prior treatment with L-dopa (Kelley & Stinus, 1985). Whether the known involvement of the dopaminergic system in hoarding from the animal literature can explain the poor response of compulsive hoarding individuals to serotonergic agents (see Pharmacological treatment section) is an attractive hypothesis that remains to be investigated.

Evidence in humans is available from brain lesion and functional neuroimaging studies. Several case studies and case series of patients who started hoarding after suffering brain lesions suggest that the anterior ventromedial prefrontal and cingulate cortices are implicated in abnormal hoarding behavior (Anderson et al., 2005; Cohen et al., 1999; Hahm et al., 2001; Volle et al., 2002). Linking the animal and lesion literature, Anderson et al. (2005) speculate that 'the evidence suggests that damage to the mesial frontal region disrupts a mechanism which normally modulates subcortically driven predispositions to acquire and collect, and adjusts these predispositions to environmental context' (p. 201).

Needless to say, the psychological and neural mechanisms involved in compulsive hoarding and hoarding in the context of brain lesions may be completely different and require further study.

2.5. Neuroimaging

Only a handful of neuroimaging studies have examined the neural correlates of compulsive hoarding in specifically selected samples.

2.5.1. Resting state studies

In their resting-state FDG-PET study, Saxena et al. (2004) found that 12 OCD patients with predominantly hoarding symptoms had reduced glucose metabolism in the posterior cingulate cortex (compared with healthy controls) and the dorsal anterior cingulate cortex (compared with non-hoarding OCD) and that severity of hoarding in the entire patient group ($n = 45$) correlated negatively with metabolism in the latter region. However, this study had several limitations that affected its interpretability. Participants were originally recruited and enrolled based on a diagnosis of OCD, not hoarding symptoms, and were retrospectively classified as having hoarding and non-hoarding OCD. This group has recently attempted to replicate these findings in a sample of 20 medication-free adults with compulsive hoarding and 18 matched controls (cited in Saxena, 2008). The authors found that compulsive hoarding individuals had significantly lower glucose metabolism in bilateral dorsal and ventral anterior cingulate cortex than controls (Saxena, 2008). Importantly, no differences in brain metabolism were found in regions typically associated with OCD. In the hoarding group, greater hoarding severity was significantly correlated with lower relative metabolism in right dorsal anterior cingulate cortex, posterior cingulate cortex, and bilateral putamen.

2.5.2. Symptom provocation studies

Mataix-Cols et al. (2004) scanned a group of 16 OCD patients and matched controls while they were asked to imagine discarding their possessions. This procedure was aided with the presentation of pictures of the items to be discarded (e.g., old newspapers, toys, empty food containers). They found that both patients and controls activated a similar network of brain regions in response to symptom provocation but, compared to healthy controls, OCD patients showed greater activation in left precentral (BA4/6) and fusiform (BA37) gyri, and in right orbitofrontal cortex (BA11). Furthermore, in the patient group, subjective anxiety during symptom provocation was significantly correlated with activation in the left precentral gyrus (sensorimotor cortex). However, only 50–56% of patients in this study endorsed hoarding symptoms on the Y-BOCS Symptom Checklist, and therefore these findings require replication in a specifically selected sample of patients with more prominent hoarding symptoms.

An et al. (2009) recruited 13 OCD patients with prominent hoarding symptoms, 16 OCD patients with nohoarding symptoms and 21 healthy controls. They employed fMRI and a symptom provocation procedureconsisting of audio instructions (e.g., 'imagine that these objects belong to you and you must throw them away for ever') and pictures of items commonly hoarded by these patients. Subjective anxiety scores suggested that the procedure was anxiety provoking for individuals with compulsive hoarding, and the severity of hoarding symptoms correlated with the level of provoked anxiety. In response to the hoarding-related (but not symptom-unrelated) anxiety provocation, OCD patients with prominent hoarding symptoms showed greater activation in bilateral anterior ventromedial prefrontal cortex (VMPFC) than patients without hoarding symptoms and healthy controls. In the entire patient group ($n = 29$), provoked anxiety was positively correlated with activation in a frontolimbic network that included the anterior VMPFC, medial temporal structures, thalamus and sensorimotor cortex. Negative correlations were observed in the left dorsal anterior cingulate gyrus, bilateral temporal cortex, bilateral dorsolateral/medial prefrontal regions, basal ganglia and parieto-occipital regions. These results were independent of the effects of age, sex, level of education, state anxiety, depression, comorbidity, and use of medication.

Finally, Tolin, Kiehl, Worhunsky, Book, and Maltby (2009) recruited 12 individuals with severe compulsive hoarding (2 of whom had OCD) and 12 healthy controls. The participants were scanned (fMRI) while making decisions about whether or not to discard personal paper items (e.g., junk mail) brought to the laboratory as well as control items that did not belong to them. Items were either saved or destroyed following each decision. Subjective anxiety scores suggested that the decision-making process was highly anxiety provoking for the compulsive hoarding individuals. When deciding whether to keep or discard personal possessions, individuals with compulsive hoarding displayed increased activation in lateral orbitofrontal cortex and parahippocampal gyrus compared to healthy controls. Among hoarding participants, decisions to keep personal possessions were associated with greater activity in superior temporal gyrus, middle temporal gyrus, medial frontal gyrus, anterior cingulate cortex, precentral gyrus, and cerebellum than were decisions to discard personal possessions.

To summarize, although evidence from neuroimaging is still preliminary, the studies to date implicate fronto-limbic circuits in the mediation of compulsive hoarding: findings that are broadly consistent with the animal and lesion literature. This contrasts with the more likely involvement of frontal-striatal loops in OCD (Saxena & Rauch, 2000). It is remarkable that similar results were obtained in compulsive hoarding samples with (An et al., 2009) and primarily without (Tolin et al., 2009) OCD, but clearly more research is needed before firm conclusions can be drawn.

2.6. Personality

Several studies have found that OCD patients with hoarding symptoms have a greater prevalence of personality disorders and traits compared to non-hoarding OCD patients. Specifically, hoarding OCD patients have particularly high frequencies of Cluster C ('anxious')

personality disorders and traits (dependent, OCPD), but also schizotypal, borderline, and histrionic personality disorders and traits (Frost, Steketee, & Williams, 2000; Frost, Steketee, Williams et al., 2000; Mataix-Cols et al., 2000; Samuels et al., 2002; Samuels, Bienvenu, et al., 2007; Samuels, Shugart, et al., 2007). As mentioned earlier (see Phenomenology section), the relation between compulsive hoarding and OCPD may be entirely due to overlapping symptom content.

There also is evidence that certain personality characteristics are associated with hoarding behavior in OCD. Fullana et al. (2004) found that, in OCD patients, hoarding was positively correlated with sensitivity to punishment and negatively with impulsivity or novelty-seeking. LaSalle-Ricci et al. (2006) found that hoarding was positively correlated to neuroticism and four of its facets (anxiety, self-consciousness, impulsiveness, and vulnerability), and negatively correlated to conscientiousness and one of its facets, order. Using the Temperament and Character Inventory (TCI; Cloninger, Przybeck, Svrakic, & Wetzel, 1994), Alonso, Gratacos, et al. (2008), Alonso, Menchón, et al. (2008) reported a positive correlation between hoarding and harm avoidance in a sample of 60 OCD patients. However, Lochner et al. (2005) failed to replicate such association in a larger sample of 129 patients.

A recent study found sex-specific differences in personality correlates of hoarding in OCD-affected individuals. In women but not men, hoarding behavior was associated with the number of schizotypal and dependent personality disorder traits. Moreover, in women but not men, hoarding was characterized by very low scores on the conscientiousness domain of the NEO, and especially on two facets of conscientiousness, namely order (i.e., less able to get organized) and self-discipline (i.e., less able to initiate and complete tasks) (Samuels et al., 2008).

Other personality characteristics, such as indecisiveness and perfectionism, also appear to be prominent in patients with compulsive hoarding. Warren and Ostrom (1988) observed that individuals with compulsive hoarding are indecisive about when to throw something away – in order to avoid the possibility of mistakenly throwing away something that will be needed later – and may also postpone having to make the decision todiscard a possession. In a sample of 32 individuals with compulsive hoarding, Frost and Gross (1993) found that hoarding was associated with indecisiveness and perfectionism (especially maladaptive evaluative concern). Samuels et al. (2002) assessed 36 individuals with OCD and compulsive hoarding and observed that they were more perfectionistic and indecisive, compared to patients with nonhoarding OCD. In a family OCD study, Samuels, Bienvenu, et al. (2007), found that both hoarding and indecision were more prevalent in the relatives of hoarding than of non-hoarding OCD patients. Interestingly, hoarding in relatives was associated with indecision in probands, independently of proband hoarding status, suggesting that indecisiveness may be a risk factor for hoarding in OCD families.

Additional work on personality traits in compulsive hoarding as a standalone problem, that is, independently from the presence of other psychiatric disorders, is needed.

3. Assessment of compulsive hoarding

Measures of hoarding have evolved with the changing understanding of the hoarding phenomenon. The earliest measure, the Y-BOCS Symptom Checklist (Goodman et al., 1989), contains two relevant items — hoarding obsessions and compulsions. Unfortunately, these items convey no information about the dimensions of hoarding or about their severity. At best, the Y-BOCS Symptom Checklist items are an indicator of hoarding. The Dimensional Yale-Brown Obsessive Compulsive Scale (Rosario-Campos et al., 2006) consists of an 88-item self-report checklist of obsessions and compulsions, which are divided into six dimensions (contamination/cleaning, harm, collecting/hoarding, symmetry/ordering, sexual/religious, and miscellaneous obsessions and compulsions), and a series of clinician-administered scales that can be used to assess the presence and severity of each symptom dimension. Each of these scales consists of three items (frequency, distress and interference) measured on a 0–5 scale, yielding a total score ranging from 0–15 (0 = no symptoms, 15 = extremely severe symptoms). In its original validation study, the DY-BOCS proved to be reliable and showed good construct and divergent validity in both child and adult populations (Rosario-Campos et al., 2006). Unlike the Y-BOCS, which measures hoarding in a dichotomous way, the DY-BOCS provides a continuous measure of hoarding severity, which is independent from other OCD symptoms. Self and clinician ratings can be obtained. Several self-report measures of OCD have included hoarding subscales (e.g., OCI-R, Foa et al., 2002; VOCI, Thordarson et al., 2004; SCOPI, Watson & Wu, 2005). These subscales are generally reliable (Abramowitz et al., 2008; Fullana et al., 2005); however, limited information is available on the validity of the hoarding subscales of the other measures. All of these subscales are brief, and none provide separate measures for hoarding symptoms such as acquisition, difficulty discarding and clutter.

The Saving Inventory-Revised (Frost et al., 2004) is a 23-item self-report questionnaire developed specifically for hoarding. All three subscales – acquisition problems, difficulty discarding and clutter – are reliable, demonstrate convergent, discriminant and divergent validity, and are sensitive to treatment effects (Tolin, Frost, & Steketee, 2007; Tortella-Feliu et al., 2006).

Two interview-based measures of hoarding have been developed. The Hoarding Rating Scale-Interview (HRS-I; Tolin et al., 2010) is a 5-question semi-structured interview assessing acquisition problems, difficulty discarding, clutter, distress, and impairment. The HRS-I has high internal reliability (Cronbach's alpha = .97) as well as high test–retest reliability (.96) that varied by time and context (clinic vs. home). It also demonstrates strong known groups validity, differentiating hoarding from OCD patients and community controls. In addition, the HRS-I correlates strongly with self-report and observational measures of hoarding (r's = .78 to.94), and only moderately or smaller with measures of other constructs such as OCD (−.16 to .34), depression (.60 to .61) and anxiety (.33 to .36). The HRS-I is sensitive to treatment as well (Steketee, Frost, Tolin, Rasmussen, & Brown, submitted for publication). A self-report version (HRS-SR) also appears to be reliable and valid (Tolin, Frost, Steketee, & Fitch, 2008; Tolin, Frost, Steketee, Gray et al., 2008). The UCLA Hoarding Severity Scale (UHSS; Saxena, Brody, Maidment, & Baxter, 2007) is a 10-item interview covering similar content in addition to decision-making difficulties and procrastination. The UHSS appears to be sensitive to treatment effects, but other psychometric properties have not yet been reported.

Among instruments that assess specific hoarding dimensions, the Clutter Image Rating (CIR; Frost, Steketee, Tolin, & Renaud, 2008) is unique in its pictorial design. It contains nine equidistant photographs (ranging from no clutter to extensive clutter) for each of three main rooms in most people's homes: living room, kitchen, and bedroom. The CIR shows strong reliability across time, context and raters, as well as good convergent and divergent validity and treatment sensitivity (Frost et al., 2008; Tolin et al., 2007). The advantage of the CIR over the clutter scale of the SIR is that it allows observer-based assessment and assessment free of the vagueness of the word 'clutter'. The Compulsive Acquisition Scale (CAS; Frost, Steketee, & Williams, 2002) is an 18-item measure of excessive acquisition and contains a compulsive buying subscale and a subscale for the excessive acquisition of free things. Both subscales have been found to be reliable and valid in a number of studies. The Saving Cognitions Inventory (SCI; Steketee, Frost, & Kyrios, 2003) is a 34-item measure of hoarding-related beliefs. The SCI has four subscales: responsibility, control, memory, and emotional attachment. The SCI has been found to be reliable and valid in studies comparing hoarding to non-hoarding OCD patients, and provides useful information for treatment planning.

4. Treatment

4.1. Pharmacological treatment

Studies assessing the efficacy of serotonin reuptake inhibitors (SRIs) in OCD patients with compulsive hoarding symptoms have produced mixed results (see Table 2). Although some studies have found that OCD patients with hoarding symptoms respond worse to SRIs than nonhoarding OCD patients (e.g., Black et al., 1998; Mataix-Cols et al., 1999; Salomoni et al., 2009; Stein et al., 2008; Winsberg et al., 1999), others found no differences between these groups (e.g., Alonso et al., 2001; Erzegovesi et al., 2001; Saxena et al., 2007; Shetti et al., 2005). One of the possible explanations for these mixed results may be the use of different selection criteria and recruitment strategies across studies, which is likely to have lead to heterogeneous samples. This is especially relevant in light of recent evidence (e.g., Abramowitz et al., 2008; Pertusa et al., 2008; Saxena, 2007) supporting the conceptualization of compulsive hoarding as a distinct pathological condition, independent from OCD (see Phenomenology section). Table 2 summarizes the main methodological differences and conclusions of studies assessing response to pharmacological treatment with SRIs in patients with hoarding symptoms. Approximately half of the studies found that hoarding individuals respond worse than nonhoarding OCD patients to SRIs, whereas the other half did not. Interestingly, the studies that found significant differences tended to have larger samples. No study to date (with the exception of Saxena et al., 2007) has measured the response of hoarding symptoms and nonhoarding OCD symptoms separately.

A possible explanation for the poorer treatment response found may be that the hoarding group in most studies was mainly composed of patients with OCD plus comorbid clinical or subclinical hoarding as defined by Frost and Hartl (1996), thus representing a more severe subsample in which the presence of comorbidity may in itself be an independent predictor of poor response to pharmacotherapy (Solvason, Ernst, & Roth, 2003). In order to overcome these methodological problems, further studies should select homogeneous samples and assess the presence, severity and treatment response of hoarding symptoms separately from that of nonhoarding OCD symptoms. Also, better symptom measurement is needed, given that the Y-BOCS score may not be well-suited to capture the main features of the hoarding behavior or be sensitive to change in this population (see Assessment of compulsive hoarding section).

Only one study to date has prospectively and quantitatively measured response to standardized pharmacotherapy in individuals with compulsive hoarding. Thirty-two patients with the compulsive hoarding syndrome and 47 nonhoarding OCD patients were treated openly with paroxetine monotherapy (mean dose, 41.6 ± 12.8 mg/d) for 12 weeks (Saxena et al., 2007). The severity of compulsive hoarding symptoms was specifically quantified before and after treatment using the UCLA Hoarding Severity Scale (UHSS). Individuals with compulsive hoarding responded as well to paroxetine as nonhoarding OCD patients. The authors indicate that they were not able to measure improvement in hoarding/saving symptoms separately from other OCD symptoms in all of their subjects, but they were able to ascertain that in a subset of 25 hoarding individuals (78% of the hoarding group), who were assessed by the UHSS before and after paroxetine treatment, hoarding symptoms improved significantly, with a mean 25% decrease in UHSS scores. This improvement is very similar to the mean 23% decrease in Y-BOCS scores measured in the overall sample. However, the results need to be interpreted in the context of several considerations. First, hoarding individuals were not recruited from clinical settings but rather through flyers and newspaper advertisements that specifically targeted 'packrats, hoarders, and clutterers'. This recruitment strategy is more likely to lead to a sample composed mainly of patients with pure hoarding with no clinically significant comorbid OCD symptoms (Pertusa et al., 2008, unpublished data). Second, patients in the hoarding group were on treatment for 17.6 days longer than those in the non hoarding group. Finally, the possibility that an abnormally low response rate to paroxetine among the non-hoarding OCD patients group (32% responders) may have contributed to the non-significant response rate between the two groups cannot be ruled out. Further, controlled studies should be carried out in order to confirm and replicate the findings of this study.

As mentioned earlier, animal studies have shown that the dopaminergic system plays a key role in hoarding (Stein, Seedat, & Potocnik, 1999). Some studies have shown tics to be more common in individuals with OCD and hoarding symptoms compared to non-hoarding OCD sufferers (Samuels, Bienvenu et al., 2007; Diniz et al., 2006). The association of hoarding with symmetry symptoms, which have been repeatedly shown to have a high comorbidity with tic disorders (Mataix-Cols et al., 1999) may at least partially account for this relation. In some patients, hoarding compulsions may be phenomenologically related to symmetry or just-right feelings (e.g., the need to pick up cigarette ends from the street), which are generally devoid of the cognitive and emotional component that underpins hoarding in patients with pathological hoarding behavior (Frost & Hartl, 1996). Thus, hoarding in the context of OCD patients displaying symmetry symptoms may be different from hoarding in patients without OCD. Therefore, future studies should carefully characterize the phenomenology of hoarding symptoms by assessing criteria for pathological hoarding as well as enquiring about the motivations for hoarding. In a recent study, Matsunaga et al. (2009) assessed the long-term effectiveness of atypical antipsychotics as augmentation therapy in patients with OCD refractory to SSRIs. Although SSRI-refractory OCD patients responded to augmentation with atypical antipsychotics, they had higher Y-BOCS scores both before and after treatment and were more likely to have hoarding symptoms – as well as symmetry/ordering and repeating rituals – compared with those who showed good responses to SSRI monotherapy. On the other hand, hoarding symptoms were assessed with the Y-BOCS Symptom Checklist, which conveys no information about the dimensions of hoarding or about their severity. Therefore, although this study presents preliminary data supporting the efficacy of antipsychotic medications in patients with OCD endorsing hoarding symptoms, the results cannot be generalized to the broader population of subjects with pathological hoarding behavior unrelated to OCD.

4.2. Psychological treatment

Individuals with compulsive hoarding frequently exhibit limited insight into the severity of their behaviors, often denying the problem, resisting intervention attempts, and defensively rationalizing their acquiring and saving (e.g., De Berardis et al., 2005; Frost & Gross, 1993; Frost & Hartl., 1996; Frost, Steketee, & Williams, 2000; Frost, Steketee, Williams et al., 2000; Matsunaga et al., 2002; Samuels, Bienvenu et al., 2007; Samuels, Shugart et al., 2007; Steketee et al., 2001; Steketee & Frost, 2003; Storch et al., 2007; Tolin, et al., 2010). This limited insight may be responsible for the treatment refusal, lack of cooperation, dropout, and poor outcomes evident in case reports of psychological treatment for hoarding (Christensen & Greist, 2001; Damecour & Charron, 1998; Fitzgerald, 1997; Greenberg, 1987; Greenberg et al., 1990; Shafran & Tallis, 1996). Early trials of exposure and response prevention (ERP) focused on discarding as many items as possible, as quickly as possible, while refraining from perfectionistic inspection (Foa & Kozak, 1997). This method showed limited efficacy in hoarding compared to non-hoarding OCD patients, and hoarding symptoms predicted premature termination, poor treatment compliance, and poor treatment response (Abramowitz, Franklin, Schwartz, & Furr, 2003; Mataix-Cols, Marks, Greist, Kobak, & Baer, 2002). Studies that have combined ERP with serotonergic medications showed an attenuated outcome for hoarding patients

Table 2
Studies assessing response to pharmacological treatment with SRIs in patients with hoarding symptoms.).

Study	Sample	Study conclusion	Comment
Alarcon et al. (1993)	45 OCD patients	Cleaning but not hoarding compulsions associated with poor response. Hoarding obsessions not looked at separately.	No support for hoarding as a predictor of treatment resistance. Relatively small sample.
Jenike et al. (1997)	64 OCD patients	Symmetry obsessions and hoarding or ordering compulsions were significantly more common in patients who responded to phenelzine than in those who responded to fluoxetine.	Suggests some evidence for effectiveness of phenelzine in hoarding compulsions in OCD patients. Criteria for hoarding not described.
Black et al. (1998)	38 OCD patients. Hoarders defined by Y-BOCS-SC, although some patients possibly had hoarding symptoms unrelated to OCD (e.g., main reason for hoarding being "recycling").	Responders to paroxetine were significantly less likely to have hoarding obsessions and compulsions.	Nonresponders had more baseline OCD symptoms overall and were more likely to have had previous drug trials. Seven of the 21 non-responders were in the placebo group, and the number of these that had hoarding symptoms was not reported.
Mataix-Cols et al. (1999)	150 OCD patients enrolled in a RCT with an SRI (84) or placebo (66). Hoarders defined by factor-analyzed dimensions of the Y-BOCS-SC	Higher scores on the hoarding dimension predicted poorer outcome following treatment with serotonin reuptake inhibitors, after control for baseline severity. Exclusion of clomipramine did not modify the overall results, suggesting a cross-serotonin reuptake inhibitor effect.	Study providing the strongest evidence for hoarding as a predictor of treatment resistance in patients with OCD. Hoarding not measured dimensionally (hoarding was present symptom in approx. 12% and major symptom in approx. 5% patients).
Winsberg et al. (1999)	20 hoarders who were treatment-seeking	18 hoarders with at least 1 adequate SRI trial: 1 (6%) marked response; 1 (6%) no response; 16 (89%) partial response (2 required augmentation).	Heterogeneous sample, possibly containing pure hoarding patients (i.e., without OCD) and some OCD hoarders who did not meet criteria for pathological hoarding (clutter criterion not endorsed). Hoarding responded overall moderately to SRIs (89% showed partial response).
Alonso et al. (2001)	60 OCD patients. Hoarders defined by Y-BOCS-SC	Hoarding no significant effect in response to treatment.	Hoarding was present symptom in 2 (3.3 %) and major symptom in 2 (3.3 %) patients.
Erzegovesi et al. (2001)	159 OCD patients enrolled in a randomized trial with an SRI. Hoarders defined by Y-BOCS-SC	Hoarding no significant effect in response to treatment (non-significant trend towards hoarding predicting poorer outcome).	Large sample. No strong support for hoarding as a predictor of treatment resistance. Response of hoarding symptoms to treatment not assessed separately (% of hoarding symptoms among nonresponders).
Shetti et al. (2005)	122 OCD patients with history of successful (67) or unsuccessful (55) response to adequate trials with at least 2 SRIs	Hoarding no significant effect in response to treatment (non-significant trend towards hoarding predicting poorer outcome).	No strong support for hoarding as a predictor of treatment resistance. Response of hoarding symptoms to treatment not assessed separately (% of hoarding symptoms among nonresponders).
Saxena (2007)	32 patients with severe hoarding behavior and 47 nonhoarding OCD patients	Hoarders responded equally well to paroxetine than OCD nonhoarders.	Only study to prospectively and quantitatively measure drug treatment response in compulsive hoarders. The hoarding group is likely to be composed of patients with pure hoarding (no OCD). This study suggests that pathological hoarding in the absence of OCD may respond to SSRIs.
Cullen et al. (2007)	221 OCD patients interviewed with the Y-BOCS-SC about lifetime (worst-ever) symptoms.	The Hoarding dimension was inversely related to a response to SSRIs as well as to a precipitous onset of symptoms.	Hoarding loaded as a separate factor and was the only predictor of poor response to SRIs. Symptoms were analyzed using a dichotomous exploratory factor analytic method.
Stein et al., (2007)	401 OCD patients enrolled in a RCT with citalopram. Hoarders defined by factor-analysed dimensions of the Y-BOCS-SC	High scores on the symmetry/hoarding and contamination/cleaning factor predicted worse outcome with citalopram	Hoarding did not load as a separate factor but in a joint factor together with symmetry. Hoarding was present symptom in approx. 12% and principal (major) symptom in approx. 11% patients.
Stein et al. (2008)	466 OCD patients enrolled in a RCT with citalopram. Hoarders defined by factor-analyzed dimensions of the Y-BOCS-SC	High scores on the symmetry/hoarding factor predicted worse treatment response to escitalopram and paroxetine.	Hoarding did not load as a separate factor but in a joint factor together with symmetry. Hoarding was present symptom in approx. 10% and principal (major) symptom in approx. 8% patients.
Matsunaga et al. (2008)	343 OCD patients. Hoarders defined by factor-analyzed dimensions of the Y-BOCS-SC	Scores on the symmetry dimension and the hoarding dimension correlated negatively with 1-year percentage improvement on the Y-BOCS	Hoarding loaded as a separate factor.
Hantouche and Demonfaucon (2008)	Survey administered to 360 OCD patients	Resistant patients (as opposed to responders) presented overall more compulsions, including washing, cognitive, repetition, and hoarding compulsions. No difference in obsessions.	Hoarding associated with poor response. Non-empirical study (i.e. efficacy not assessed by clinician).
Masi et al. (2009)	257 children with OCD. Hoarding defined by Children's Y-BOCS	Irrespective of the pharmacological treatment (SRI in monotherapy or in combination with another drug), responders were less likely to present the hoarding phenotype.	In children with OCD, the presence of hoarding symptoms seems to be associated with a worse response to pharmacological treatment.
Salomoni et al. (2009)	130 subjects with OCD. Hoarding defined by factor-analyzed Y-BOCS	Hoarders more likely to be non-responders.	The study used an Artificial Neural Network Model for the prediction of treatment response.

Abbreviations: OCD (Obsessive–Compulsive Disorder); RCT (Randomised Controlled Trial).

compared to non-hoarding ones (Black et al., 1998; Rufer et al., 2005; Saxena et al., 2002; Winsberg et al., 1999).

Cognitive-behavioral therapy (CBT) based on Frost and Steketee's hoarding model (see Steketee & Frost, 2008) has shown promise. This treatment includes office and in-home sessions that focus on motivational interviewing; skills training (organizing, decision-making, problem solving); exposure to sorting, discarding, and not acquiring; and cognitive restructuring. In a recent open trial (Tolin

et al., 2007), 14 moderate to severe hoarding patients received 26 sessions of CBT over 7–12 months. The 10 treatment completers showed significant decreases at post-treatment on standardized measures of hoarding behavior; half of the sample was rated 'much improved' or 'very much improved' on clinical global improvement ratings. The observation that many patients showed limited treatment adherence (e.g., homework completion), and that adherence was strongly associated with outcome, led to refinement of the treatment manual with additional emphasis on motivational enhancement strategies (e.g., Miller & Rollnick, 2002). In a larger controlled trial using the revised CBT manual, CBT patients showed significantly more benefit after 12 weeks compared to waitlisted patients, and the combined sample of 37 patients improved significantly after 26 sessions (Steketee, Frost, Tolin, Rasmussen, & Brown, submitted for publication). Hoarding symptoms improved by 23–37%, with approximately 70% of patients considered treatment responders based on clinical global improvement ratings. Reformatting these CBT methods for group treatment and for web-based self-help interventions are currently under study and appear to be promising (Muroff et al., 2009). Thus, CBT modified for hoarding appears to be a promising intervention for compulsive hoarding. Long-term follow-up studies will be important to establish if these gains can be maintained.

5. Discussion

Clinically significant compulsive hoarding occurs in up to 5% of the population, twice the rate of OCD and almost four times the rate of disorders such as bipolar disorder and schizophrenia, and can vary from mild to life threatening. The personal and pubic health consequences of compulsive hoarding are substantial and it is generally considered difficult to treat. Much remains to be done in order to understand the causes and develop cost-effective interventions for this problem. In our view, a crucial first step towards achieving those goals will be to generate a consensus about the nosological status of compulsive hoarding and to derive and test a set of valid and reliable diagnostic criteria.

5.1. The nosological status of compulsive hoarding

We have reviewed literature showing that hoarding can be a symptom of several organic and psychiatric conditions. In most cases, the diagnosis is relatively straightforward and the treatment, when available, is according to the main underlying condition. One of the main conclusions of this review is that, although most of the studies on compulsive hoarding have been conducted in patients with OCD, pathological hoarding behavior often occurs in isolation or independently from other disorders. OCD is just one of the possible – but not the most frequent – comorbidities. Compulsive hoarding is also associated with several personality disorders including OCPD, but when the overlap in item content is taken into consideration, hoarding is no longer specifically associated with OCPD.

With the exclusion of those cases in which the hoarding behavior appears to be secondary to certain neurological (e.g., dementia or brain lesions) or psychiatric (e.g., schizophrenia, OCD, depression) disorders, the phenomenology of hoarding is consistent, regardless of whether it occurs in isolation or comorbid with other mental disorders. This fact, taken together with other preliminary evidence from epidemiological, genetic, neuroimaging and treatment studies, suggests that hoarding may constitute a separate syndrome and thus could be better conceptualized as a distinct nosological entity with its own diagnostic criteria.

A set of provisional working criteria for pathological hoarding behavior are listed in Table 3. Note that OCD is one of the key differential diagnoses to make when diagnosing compulsive hoarding. Although most compulsive hoarders do not meet diagnostic criteria for OCD if hoarding symptoms are not counted toward the diagnosis, OCD and compulsive hoarding can co-occur in some cases. When this happens, the clinician needs to establish whether hoarding is a consequence of other OCD symptoms (e.g., fear of harm or contamination) or whether it is an independent problem (i.e., a truly comorbid disorder). These criteria should be further developed and field-tested for validity, reliability and acceptability.

Table 3
Working diagnostic criteria for compulsive hoarding.

Criterion 1.
Difficulty discarding or parting with personal possessions, even those of apparently useless or limited value, due to strong urges to save items and/or distress associated with discarding.
Criterion 2.
The symptoms result in the accumulation of a large number of possessions that clutter the active living areas of the home (e.g., living room, kitchen, bedroom), workplace or other personal surroundings (e.g., office, vehicle, yard). If clutter is not present in these areas, it is only because of other's efforts (e.g., family members, authorities) to keep these areas uncluttered.
Criterion 3.
The symptoms or resulting clutter cause clinically significant distress, and/or impairment in social, occupational or other important areas of functioning, and/or significant risk to health or safety.
Criterion 4.
The symptoms and clutter have persisted for at least 6 months.
Criterion 5.
The symptoms are not better accounted for by another developmental (e.g. autism, Prader–Willi Syndrome) or mental disorder (e.g., OCD, major depressive disorder, schizophrenia).
Criterion 6.
The symptoms are not due to the direct physiological effects of a substance (e.g., a drug of abuse, a medication, or other treatment) or a general medical or neurological condition (e.g., brain lesion, cerebral vascular disease, dementia, hypothyroidism).
Specify if
With excessive acquisition: if excessive acquiring through compulsive buying, excessive collecting of free items that are not needed and/or not affordable, or kleptomania/stealing has contributed to the clutter and difficulties in discarding.

If it eventually becomes a separate diagnostic category, the most appropriate 'neighborhood' for compulsive hoarding is unclear. Until we learn more about its etiology, the decision will necessarily require expert consensus. For the time being, it would be reasonable to acknowledge compulsive hoarding as a separate OCD-related syndrome with a similar status as body dysmorphic disorder (BDD), tic disorders, and trichotillomania. However, compulsive hoarding may have ties with impulse control disorders, particularly compulsive buying, but more research is needed.

The classification of some hoarding-related clinical presentations such as the so-called Diogenes syndrome (self-neglect or squalor) or animal hoarding is less clear and will also require further research before firm conclusions can be made.

5.2. A final word on terminology

As other authors (e.g., Maier, 2004) have pointed out, the term 'hoarding' is – without further specifications – of limited heuristic value and thus cannot guide therapeutic interventions satisfactorily or be conceptualized as a single pathological condition.

Currently, the most widely accepted term for describing pathological hoarding behavior is compulsive hoarding. This is an attempt to distinguish hoarding as a psychiatric symptom from hoarding as a discrete syndrome. However, the term 'compulsive' may be misleading as far as its phenomenological (compulsions are repetitive or stereotypic, emotionally negative, and typically distressing and frustrating, whereas hoarding behaviors are emotionally neutral and usually not so distressing or stereotypic in nature) and etymological (i.e., 'compulsive' may be interpreted as 'secondary to obsessive–compulsive disorder') implications are concerned. Expert consensus is needed in order to establish a clinically useful term for pathological hoarding behavior.

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