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Neuropsychological functioning in hoarding disorder

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ABSTRACT

Hoarding disorder (HD) is increasingly viewed as distinct from obsessive–compulsive disorder (OCD). In particular, some researchers have suggested that HD is characterized by substantial problems of neurocognitive function; however, HD patients have not yet been compared to OCD patients in this respect. The aim of the present study was to compare neuropsychological test performance in HD patients ($n=27$), OCD patients ($n=12$), and healthy controls ($n=26$). Consistent with previous research, HD patients showed an attenuated ability to sustain attention and poorer employment of adaptive memory strategies compared to healthy controls. HD and OCD patients did not differ significantly on these measures, although moderate effect sizes suggested that hoarders showed somewhat greater attenuation of attentional capacity. Rates of true impairment on any particular neuropsychological test were fairly low across all three groups, although 67% of HD patients (compared to 58% of OCD patients and 42% of healthy controls) scored in the impaired range on at least one measure (odds ratio = 2.22). Results are discussed in terms of emerging conceptualizations of HD as a distinct illness.

1. Introduction

Hoarding disorder (HD), defined as the acquisition of and failure to discard large volumes of possessions, resulting in clutter that precludes normal use of living spaces (Frost and Gross, 1993; Frost and Hartl, 1996), is associated with high levels of functional impairment (Tolin et al., 2008) and health risks (Frost et al., 2000). As an example of the latter, a recent analysis of house fires in Melbourne, Australia, over a 10-year period found that hoarding was determined to be a factor in 24% of all preventable fire fatalities (Lucini et al., 2009).

Increasingly, researchers are suggesting that HD may be distinct from obsessive–compulsive disorder (OCD; Grisham et al., 2005; Abramowitz et al., 2008; Pertusa et al., 2010), and are focusing on possible neurocognitive contributors to the subjective problems of decision-making in HD patients. Individuals with HD have a high rate of ADHD comorbidity (Sheppard et al., 2010; Frost et al., 2011), report high levels of indecisiveness and other problems of decision-making (Frost and Gross, 1993; Frost and Shows, 1993; Samuels et al., 2002; Steketee et al., 2003), and exhibit difficulty categorizing possessions (Luchian et al., 2007; Wincze et al., 2007; Grisham et al., 2010). These observations raise the possibility of a pattern of neurocognitive deficits underlying HD.

To date, five published studies (Hartl et al., 2004; Lawrence et al., 2006; Grisham et al., 2007, 2010; Jang et al., 2010) have examined neuropsychological performance in patients with hoarding behaviors [a sixth study (Anderson et al., 2005) assessing patients who developed hoarding behavior after acquired brain lesions will not be reviewed here]. Hartl et al. (2004) administered the Rey–Osterrieth Complex Figure Test (RCFT) and California Verbal Learning Test (CVLT) to 22 HD patients and 24 healthy control participants. HD patients recalled less information on delayed recall on the RCFT and CVLT; less effective organizational strategies on the RCFT using Savage et al.'s (1999) scoring protocol were also noted. Lawrence et al. (2006) administered the Wisconsin Card Sorting Task (WCST) and Iowa Gambling Task (IGT) to 39 OCD patients, 10 of whom received high scores on a measure of hoarding symptoms, and 40 controls. Although hoarding vs. non-hoarding differences were not described for the WCST, hoarding OCD patients performed more poorly than did non-hoarding OCD patients and controls on the IGT (specifically, hoarding OCD patients did not exhibit learning of the correct strategy). Grisham et al. (2007) tested 30 HD patients, 30 mixed clinical (non-OCD) patients, and 30 healthy controls. Compared to healthy controls and mixed clinical patients, HD patients performed worse on Visual Memory Span (VMS), showed greater variability of hit reaction time on the Continuous Performance Task (CPT), and made more errors of commission on the CPT. No differences were found among the groups on the IGT. More recently, Grisham et al. (2010) compared 19 HD patients, 17 mixed clinical (non-OCD) patients, and 20 healthy controls on an Affective Go/NoGo (AGN) task, Intra–Extra Dimensional (IED) set shifting task, the Stockings of Cambridge task (SOC; a computerized adaptation of the Tower of London task), and the Cambridge Gambling Task (GCT; an adaptation of the IGT). The HD

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group solved significantly fewer problems on the SOC task than did the other two groups, suggesting poorer problem-solving ability. No differences in attention, impulsivity, mental flexibility, or decision making/strategy learning were found on the AGN, IED, or CGT tests. Finally, Jang et al. (2010) administered the RCFT to 144 OCD patients. The number of patients with hoarding symptoms was not reported. The presence of hoarding symptoms, as measured by the symptom checklist of the Yale–Brown Obsessive–Compulsive Scale (Y-BOCS), did not correlate with any RCFT scores (by comparison, symmetry/ordering and obsessions/checking symptoms did correlate negatively with recall and memory organization).

Thus, the extant research suggests that patients with HD might be characterized by problems in sustained attention, impulsivity, and problem-solving, as well as possible problems of memory and memory strategy use. It is noted, however, that no study to date has compared the neuropsychological performance of HD patients to that of OCD patients, with the very limited exception of Lawrence et al.'s (2006) IGT results and Jang et al.'s (2010) investigation of the hoarding symptom dimension among OCD patients. A direct comparison of true HD patients vs. OCD patients might help clarify the current uncertainty regarding diagnostic placement of hoarding (Pertusa et al., 2010), by examining whether HD patients and OCD patients show similar or dissimilar patterns of neurocognitive function. It is further noted that none of these studies reported actual rates of impairment (i.e., below-average performance). Although they showed that individuals with HD performed worse than did control groups, it is not clear whether these differences truly reflect impaired neuropsychological functioning among individuals with HD. The aim of the present study is to compare the neuropsychological functioning of individuals with HD, individuals with non-hoarding OCD, and healthy control participants. It was predicted that, compared to OCD patients and healthy controls, HD patients would exhibit significantly poorer performance on indices of attention, memory and memory strategy, impulsivity, and executive function.

2. Methods

2.1. Subjects

Sixty-five adult participants met inclusion criteria of age 18–65; fluent in English; absence of lifetime bipolar, psychotic, developmental, or substance use disorders; absence of medical conditions known to impact brain function; and (for the clinical groups) symptom duration of 1 year or more and *Clinician's Global Impressions* (CGI; Guy, 1976) rating of 4 (moderately ill) or higher. Furthermore, participants were included if they could be classified into one of three diagnostic groups: *HD* (primary diagnosis of hoarding disorder, no diagnosis of non-hoarding OCD; $n=27$), *OCD* (primary diagnosis of non-hoarding OCD, no diagnosis of hoarding; $n=12$), or *Healthy Controls* (no lifetime psychiatric diagnosis or treatment; $n=26$). Primacy of diagnoses was ascertained using clinical severity ratings (CSRs) from the *Anxiety Disorders Interview Schedule for DSM-IV* (ADIS-IV; Brown et al., 1994). Two (7%) of the HD participants were taking psychiatric medications (buproprion and velnafaxine), and 2 (17%) of the OCD participants were taking psychiatric medications (fluvoxamine and setraline). It should be noted that patients with co-occurring HD and OCD, which comprise approximately 18% of HD patients (Frost et al., 2011), were excluded.

2.2. Materials

2.2.1. Clinical interviews

Psychiatric diagnoses were ascertained using the *ADIS-IV* (Brown et al., 1994). Reliability for the various DSM-IV categories contained in the ADIS-IV extends from good to excellent, ($\alpha=0.41$–0.86) (Brown et al., 2001). Assessors were trained to criterion (100% agreement on diagnostic classification and within one CSR point on all diagnoses), with regular inter-rater reliability checks to prevent rater drift. Hoarding diagnoses were made using the *Hoarding Rating Scale-Interview* (HRS-I; Tolin et al., 2010), a semi-structured interview that assesses the severity of clutter, acquisition, difficulty discarding, distress, and impairment, each on a 0–8 scale. The HRS-I shows excellent internal consistency and reliably discriminates hoarding from non-hoarding participants (Tolin et al., 2010). OCD symptoms were assessed using the *Yale–Brown Obsessive–Compulsive Scale* (Y-BOCS; Goodman et al., 1989a, 1989b), a semi-structured interview of the severity of obsessive thoughts and compulsive behaviors. The Y-BOCS shows excellent interrater reliability and sound internal consistency, and strong test–retest reliability (Goodman et al., 1989b; Woody et al., 1995). For purposes of the present study, hoarding symptoms were not used in calculating Y-BOCS scores. Overall illness severity was determined using the *CGI* (Guy, 1976). The CGI shows good test–retest reliability (Dahlke et al., 1992) and correlates strongly with clinician rated anxiety and depression symptoms (Leon et al., 1993).

2.2.2. Self-report measures

Severity of the core features of hoarding (clutter, difficulty discarding, acquiring) was assessed using the *Saving Inventory-Revised* (SI-R; Frost et al., 2004), a 23-item questionnaire of compulsive hoarding severity. Internal consistency is excellent for the total score and for the 3 subscales. The SI-R readily discriminates hoarders from OCD patients and community controls, and correlates significantly with ratings of clutter and impairment (Frost et al., 2004). Specific OCD symptom dimensions were measured using the *Obsessive–Compulsive Inventory-Revised* (OCI-R; Foa et al., 2002), an 18-item questionnaire that assesses OCD symptoms across six factors, with possible scores ranging from 0 to 12: 1) washing, 2) checking/doubting, 3) obsessing, 4) mental neutralizing, 5) ordering, and 6) hoarding. The OCI-R possesses excellent test–retest reliability in OCD patients (Foa et al., 2002) and reliably discriminates among OCD subtypes (Huppert et al., 2007). Levels of general psychological distress were assessed using the *Depression Anxiety Stress Scale* (DASS; Lovibond and Lovibond, 1995b), a 42-item self-report measure that assesses symptoms of depression, anxiety, and stress over the past week on a 4-point scale. The three subscales of depression, anxiety, and stress have demonstrated good internal consistency, and factor analyses have supported the convergent and discriminant validity of the scales (Lovibond and Lovibond, 1995a). In addition, the DASS has demonstrated adequate test–retest reliability, and adequately distinguished between clinician-rated mood and anxiety disorders (Brown et al., 1997).

2.2.3. Neuropsychological tests

The *Wechsler Test of Adult Reading* (WTAR) (Holdnack, 2001) was used to estimate premorbid intellectual function. The University of Pennsylvania version (Kurtz et al., 2001) of the *Continuous Performance Test* (CPT; Beck et al., 1956) was used to assess sustained visual attention and impulsivity. Mean hit (correct response) reaction time (*HRT*) was selected as a measure of sustained attention, and number of commission errors was selected as a measure of impulsivity; both variables have been used in prior research (Grisham et al., 2007). The *California Verbal Learning Test-II* (CVLT-II; Delis et al., 2000) was used to assess verbal memory. The dependent measure was the total number of words recalled across the 5 list presentations. The *Rey–Osterrieth Complex Figure Test* (RCFT; Osterrieth, 1944) was used to measure visual organization and visual memory. The Myers and Meyers (1995) administration and scoring procedures were used, as well as Savage et al.'s (1999) organizational score for assessing memory strategy use. The dependent measures selected, based on previous research (Hartl et al., 2004), were delayed recall and organizational score. The *Hooper Visual Organization Test* (HVOT; Hooper, 1958) was used to measure visuospatial/visuomotor functioning. Total correct was the dependent measure. The 128-card paper-and-pencil version (Heaton, 1981) of the *Wisconsin Card Sorting Test* (WCST; Berg, 1948) was used as a measure of rule-learning and conceptual flexibility. Number of total errors was selected as the dependent measure. The *Tower of London* (TOL; Shallice, 1982) test, a measure of planning and implicit and skill memory, was also used. The number of moves to complete the task was the dependent measure. The *Stroop Color Word Test* (Golden, 1978) was used as a measure of selective attention and cognitive flexibility. Time to complete the color–word condition was the dependent measure. The *Controlled Oral Word Association Test-FAS* (COWAT-FAS; Benton and Hamsher, 1989) was used as a measure of the ability to generate words to a phonemic cue. Total correct across the three trials was the dependent measure. The *Animal Naming Test* (Rosen, 1980) was used as a measure of the ability to generate words to a semantic cue. Total number of words generated was selected as the dependent measure.

2.3. Procedures

Participants were recruited via newspaper advertisements and flyers, as well as from the patient flow at a specialty anxiety clinic. Of note, the hoarding participants were recruited specifically for hoarding or clutter problems, not for OCD, which may result in a more representative sample given the rather low rate of true OCD among hoarders (Frost et al., 2011). After providing written informed consent, participants met with a trained graduate-level interviewer who administered the ADIS-IV, HRS-I, Y-BOCS, and CGI. Once these measures were completed, participants completed the battery of neuropsychological measures, administered by a trained graduate-level assessor, in a separate, single session.

2.4. Statistical analyses

Data were analyzed using SPSS version 15. Differences on neuropsychological tests among the three groups were examined using a series of one way Analyses of Variance (ANOVAs) with Tukey HSD follow-up tests. Effect size estimates were calculated as Cohen's *d*. These analyses were repeated as Analyses of Covariance (ANCOVAs), using age, DASS Depression, and DASS Anxiety scores as covariates. To examine more closely the prevalence of true neuropsychological impairment, participants were coded as impaired or not impaired on each measure according to whether their scores deviated from published norms by 1.5 S.D. or more. Rates of impairment among the three groups were compared using χ^2 analyses. Effect size estimates were calculated as odds ratios (ORs). Exploratory Pearson correlations were conducted between CPT HRT scores and each subscale of the OCI-R.