

Hoarding in Obsessive-Compulsive Disorder: Clinical and Genetic Correlates

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Objective: Hoarding may be an important symptom dimension in obsessive-compulsive disorder (OCD). Hoarding in OCD has been associated with poor insight, poorer response to selective serotonin reuptake inhibitors than other OCD symptom dimensions, and a distinctive psychobiological profile. The clinical and genetic correlates of hoarding in OCD therefore deserve additional investigation.

Method: Adult OCD patients (N = 315) underwent a comprehensive clinical assessment that included the Structured Clinical Interview for DSM-IV Axis I Disorders (Patient Edition) and for Diagnosis of Obsessive-Compulsive Spectrum Disorders. DNA extracted from venous blood (10–30 mL) in a Caucasian subset of the interviewed OCD patients (N = 204) and Caucasian controls (N = 169), including patients (N = 94) and controls (N = 138) of Afrikaner descent, was genotyped to investigate polymorphisms in genes involved in monoamine function and previously hypothesized to be relevant to OCD. Data were collected from 1998 through 2004.

Results: OCD patients with hoarding made up 18.1% of the total sample. Compared with nonhoarding OCD, OCD with hoarding was associated with a number of comorbid Axis I disorders, obsessive-compulsive personality disorder, significantly higher OCD severity scores, and more functional impairment. In subjects of Afrikaner descent, the *L/L* genotype of the *COMT Val158Met* polymorphism was significantly more common in the OCD hoarding group, with a preponderance of low activity alleles, compared with nonhoarding patients and controls.

Conclusions: These data are consistent with the hypothesis that hoarding represents a unique symptom subtype in OCD with a distinctive clinical and psychobiological profile. Further work is needed to determine the psychobiological mechanisms responsible for hoarding and to replicate the genetic findings noted here.

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Hoarding may be defined as the acquisition of and failure to discard possessions of little use or value to others and may represent an important symptom subtype in patients with obsessive-compulsive disorder (OCD).^{1–4} Approximately 18% of adult OCD patients have been reported to have hoarding symptoms,⁵ and hoarding appears to comprise an independent dimension in factor analysis of obsessions and compulsions.⁶

There is evidence that hoarding in OCD has specific clinical and neurobiological correlates. In particular, patients with hoarding have been suggested to demonstrate less insight,⁷ have decreased glucose metabolism in the right posterior cingulate gyrus and the bilateral cuneus,⁸ and have been reported less likely to respond to treatment with selective serotonin reuptake inhibitors (SSRIs) compared with patients with nonhoarding OCD symptoms.^{9,10} Such findings are consistent with preclinical research suggesting that hoarding is mediated by dopaminergic rather than serotonergic systems.⁴ In addition, it has been suggested that hoarding aggregates in families; for example, first-degree relatives of OCD patients who hoard were found more likely to have hoarding symptoms than the relatives of nonhoarding OCD patients.¹¹

The relative homogeneity of OCD has arguably facilitated research on this condition.¹² Nevertheless, a compre-

hensive understanding of the disorder may require more detailed delineation of its phenomenological and psychobiological heterogeneity.¹³ Such work requires large clinical samples, which are comprehensively assessed in terms of symptom subtype, psychiatric comorbidity, and other factors that may contribute to variance.

In this article, we report on the clinical and genetic correlations of hoarding in a relatively large sample of OCD patients. Patients presenting to our unit include Afrikaner South Africans; this population is descended from relatively few founder families, and its genetic homogeneity has proved useful in exploring the genetic bases of a number of disorders,^{14,15} including Tourette's disorder,¹⁶ a condition thought to be genetically related to OCD that may also be characterized by hoarding symptoms.¹⁷

METHOD

Subjects

Three hundred fifteen adult OCD patients (162 male; 153 female) took part in the study. All patients met DSM-IV criteria for OCD¹⁸ on the Structured Clinical Interview for DSM-IV Axis I Disorders (Patient Edition) (SCID-I/P).¹⁹ An experienced clinical researcher interviewed patients referred from a wide range of sources (the OCD Association of South Africa, community-based primary care practitioners, and specialist psychiatrists). A history of psychosis, inadequate understanding of the aims and practical implications of participation, and unwillingness to provide consent after reading the information and consent forms were exclusion criteria. The study was approved by the Institutional Review Board of the University of Stellenbosch, Cape Town, South Africa, and all participants gave informed written consent to participate after risks and benefits had been fully explained.

Data Collection

Demographic data (including age, gender, marital status, and employment status) were collated. OCD symptoms were assessed using the Yale-Brown Obsessive Compulsive Scale (YBOCS).²⁰

Comorbid disorders were assessed using the SCID-I/P,¹⁹ selected parts of the Structured Clinical Interview for DSM-IV Personality Disorders,²¹ and the Structured Clinical Interview for the Diagnosis of Obsessive-Compulsive Spectrum Disorders.²²

Age at onset of OCD was noted. Insight was assessed using the relevant item of the YBOCS. Presence and severity of tics were assessed by history and using the Yale Global Tic Severity Scale.²³ Response to cognitive-behavioral therapy and pharmacotherapy response were assessed retrospectively using the Clinical Global Impressions scale change item.²⁴

Patients also completed the Disability Profile,²⁵ the Childhood Trauma Questionnaire,²⁶ and the Temperament and Character Inventory.²⁷

Genotyping

DNA was extracted from venous blood (10–30 mL) in a Caucasian subset of the interviewed OCD patients (N = 204) and Caucasian controls (N = 169), including patients (N = 94) and controls (N = 138) of Afrikaner descent. The group of controls was a convenience sample representative of the local Caucasian population and did not undergo diagnostic interviews. Each subject was genotyped for polymorphisms in genes involved in monoamine function that have previously been hypothesized to play a role in OCD pathogenesis. The polymorphisms investigated were a 48 base pair (bp) variable number of tandem repeats (VNTR) in the third exon of the dopamine receptor 4 (*DRD4*);²⁸ a 40bp VNTR in the 3' untranslated region of the dopamine transporter (*DAT*);²⁹ a 44bp insertion/deletion polymorphism in the promoter region of the serotonin transporter (*5-HTT*);³⁰ and single nucleotide polymorphisms in the serotonin receptor type 1B (*5-HT_{1B}*, previously referred to as *5-HT_{1Dβ}*) (*G861C*),³¹ the serotonin receptor type 2A (*5-HT_{2A}*) (*T102C*),³² tyrosine hydroxylase (*TH*) (*Val81Met*),³³ catechol *O*-methyl transferase (*COMT*) (*Val158Met*),³⁴ and monoamine oxidase A (*MAO-A*) (*C1460T/EcoRV*).³⁵ Previously described genotyping protocols³⁶ were followed.

Data Analysis

Clinical and genetic data were compared in OCD patients with and without hoarding symptoms using χ^2 and Student *t* tests as appropriate. Although lifetime history of OCD was collected, the analyses focused on those with current OCD symptoms.

RESULTS

Demographics

OCD patients with current hoarding symptoms made up 18.1% (i.e., N = 57, with 27 of these being of Afrikaner descent) of the total sample. Similarly, when lifetime hoarding symptomatology was assessed, findings suggested that 23.0% of patients manifested hoarding symptoms. There were no differences in demographic variables between OCD patients with and without hoarding, except that hoarders were significantly older at the time of the interview (Table 1). There were also no differences in demographic variables between Afrikaner and non-Afrikaner OCD patients.

Clinical Characteristics

OCD patients with hoarding symptoms had significantly higher rates of lifetime major depressive disorder, dysthymic disorder, specific phobia, generalized anxiety

Table 1. Demographic Data in Patients With Obsessive-Compulsive Disorder (OCD) With and Without Hoarding Symptoms

Variable	OCD With Hoarding (N = 57)	OCD Without Hoarding (N = 258)	Statistic	p
Gender				
Male	28	134		NS
Female	29	124		
Age, mean (SD), y	37.00 (15.27)	31.65 (13.70)	t = -2.61	.009
Completed high school, %	47	50		NS
Unemployed, %	9	6		NS

Abbreviation: NS = nonsignificant.

disorder (GAD), and obsessive-compulsive personality disorder (OCPD) (Table 2) as well as significantly higher OCD severity scores than nonhoarders (Table 3). In addition, hoarders reported more impairment in a number of areas of functioning, including work-related activities, family life, marriage/dating, friendships, other interests (e.g., religious activities, hobbies, sport), and activities of daily living (e.g., personal hygiene, household chores) (Table 4).

There was no significant difference between patients with and without hoarding in age at onset of OCD. Although hoarders had poorer insight and worse response to treatment compared with nonhoarders, this difference did not reach statistical significance. In addition, there was no significant difference between the 2 groups in terms of childhood interpersonal trauma (Table 5) and temperament/character (Table 6). Afrikaner and non-Afrikaner hoarders did not differ on clinical variables, except that Afrikaner hoarders had less impairment in work-related activities ($F = .502$; $p = .02$).

Genetics

Genetics/lab data are reported for 89 Afrikaner OCD patients and 81 controls, as not all samples were genotyped for all selected polymorphisms.

There were no statistically significant differences in the distribution of alleles or genotypes of the analyzed polymorphisms across the Caucasian subset of subjects with hoarding (N = 45), subjects without hoarding (N = 159), and controls (N = 169). However, in the Afrikaner group, genotype frequency differed significantly between OCD patients with hoarding (N = 18), patients without hoarding (N = 71), and controls (N = 81) ($\chi^2 = 10.72$; $p = .03$) (Table 7) for the *COMT Val158Met* polymorphism, with a preponderance of individuals with the *met/met (L/L)* genotype in the hoarder group, compared with either nonhoarding OCD patients ($\chi^2 = 8.44$; $p = .02$) or controls ($\chi^2 = 10.41$; $p = .005$). There was a total absence of the *val/val (H/H)* genotype in the Afrikaner OCD hoarding group. Similarly, allele frequency differed significantly between Afrikaner OCD patients with hoarding and those

Table 2. Comorbidity (lifetime) Data in Patients With Obsessive-Compulsive Disorder (OCD) With and Without Hoarding Symptoms

Comorbid Disorder	OCD With Hoarding, % (N = 57)	OCD Without Hoarding, % (N = 258)	χ^2	p
Major depressive disorder	75.44	60.47	4.70	.03
Dysthymic disorder	24.57	12.65	4.69	.03
Specific phobia	26.32	12.65	6.01	.01
Generalized anxiety disorder	22.81	7.91	9.11	.003
Social anxiety disorder	14.04	8.70	1.39	NS
Anorexia nervosa	1.75	3.95	0.77	NS
Bulimia nervosa	3.51	4.35	0.09	NS
Binge-eating disorder	1.75	2.77	0.21	NS
Body dysmorphic disorder	10.53	5.53	1.70	NS
Hypochondriasis	7.02	2.77	2.06	NS
Tourette's disorder	7.02	3.95	0.91	NS
Tics	15.79	12.40	0.45	NS
Intermittent explosive disorder	21.05	13.44	1.98	NS
Kleptomania	5.26	2.77	0.82	NS
Trichotillomania	10.53	5.93	1.40	NS
Self-injury	21.05	15.81	0.87	NS
Compulsive shopping	8.77	3.95	2.02	NS
Obsessive-compulsive personality disorder	63.27	36.28	11.84	.001
Avoidant personality disorder	31.43	18.29	2.84	NS
Schizotypal personality disorder	3.33	3.53	0.003	NS
Borderline personality disorder	33.33	21.18	1.98	NS

Abbreviation: NS = nonsignificant.

without hoarding and controls ($\chi^2 = 6.16$; $p < .05$) (Table 8), with a preponderance of *met (L)* alleles in hoarding compared with nonhoarding OCD patients ($\chi^2 = 4.49$; $p = .03$) and controls ($\chi^2 = 6.13$; $p = .01$). Given the small sample size (Afrikaners), we did not correct for multiple testing.

DISCUSSION

The main findings of this study of adult OCD patients include the presence of a significant association between hoarding symptoms and a number of comorbid Axis I disorders (including depression and GAD), OCPD, significantly higher OCD severity scores, and more functional impairment. There were also statistically significant differences between the genotype and allele distribution of the *COMT Val158Met* polymorphism between Afrikaner OCD patients with hoarding and those without hoarding and Afrikaner controls, respectively, with a preponderance of *met/met (L/L)* genotypes and *met (L)* alleles in hoarding compared with nonhoarding patients and controls.

The proportion of patients with significant hoarding symptoms in our sample was remarkably similar to that found in a previous study of a large number of OCD patients.⁵ We found no significant demographic correlates of

Table 3. Clinical Data in Patients With Obsessive-Compulsive Disorder (OCD) With and Without Hoarding Symptoms

Variable	OCD With Hoarding (N = 57)	OCD Without Hoarding (N = 258)	Value	p
Age at OCD onset, mean (SD), y	16.74 (10.61)	17.23 (10.59)	t = -0.30	NS
Severity (YBOCS total score), mean (SD)	21.92 (6.53)	19.34 (7.91)	t = -2.22	.03
Poor insight, %	15	10	$\chi^2 = 0.80$	NS
Response to pharmacotherapy (CGI-C ^a), N/N (%)	20/28 (71.4)	103/131 (78.6)	$\chi^2 = 0.65$	NS
Response to CBT (CGI-C ^a), N/N (%)	7/14 (50)	49/71 (69)	$\chi^2 = 1.80$	NS

^aPatients reported minimal to much improvement.

Abbreviations: CBT = cognitive-behavioral therapy, CGI-C = Clinical Global Impressions scale change item, NS = nonsignificant, YBOCS = Yale-Brown Obsessive Compulsive Scale.

Table 4. Disability Profile Ratings (past 2 weeks) in Patients With Obsessive-Compulsive Disorder (OCD) With and Without Hoarding Symptoms^a

Domain	OCD With Hoarding (N = 57)	OCD Without Hoarding (N = 258)	F	p
Work	2.03 (1.00)	1.16 (1.09)	3.41	< .001
Family	1.50 (1.27)	1.06 (0.96)	7.23	< .05
Marriage/dating	1.63 (1.28)	1.08 (1.20)	0.56	.01
Friendships	1.26 (1.13)	0.82 (0.94)	2.65	.01
Other interests	1.84 (1.21)	1.16 (1.17)	0.14	.002
Activities of daily life	1.92 (1.06)	1.23 (1.08)	0.41	< .001
Suicide	0.32 (0.50)	0.20 (0.50)	3.91	NS
Total disability	10.55 (5.19)	6.73 (4.98)	0.19	< .001

^aAll values are mean (SD) scores.

Abbreviation: NS = nonsignificant.

Table 5. Childhood Interpersonal Trauma Scores for Patients With Obsessive-Compulsive Disorder (OCD) With and Without Hoarding Symptoms^a

Item	OCD With Hoarding (N = 27)	OCD Without Hoarding (N = 101)	F	p
Emotional abuse	10.44 (4.42)	10.54 (5.13)	0.38	NS
Physical abuse	7.78 (3.57)	7.42 (3.64)	0.11	NS
Sexual abuse	7.22 (4.74)	7.14 (4.29)	0.35	NS
Emotional neglect	10.89 (4.86)	11.02 (5.41)	0.002	NS
Physical neglect	6.04 (1.60)	6.22 (2.12)	0.43	NS
Validity scale	0.78 (1.09)	0.56 (0.97)	1.28	NS
CTQ total	43.15 (13.34)	42.90 (15.63)	0.01	NS

^aAll values are mean (SD) scores; Ns reflect the number of patients who completed the CTQ.

Abbreviations: CTQ = Childhood Trauma Questionnaire, NS = nonsignificant.

hoarding, and although previous reports suggested hoarders are more likely to be female³⁷ or unmarried,³ those were not OCD patient samples. Our findings support previous data that compulsive hoarding in OCD is associated with significant comorbid psychopathology, including comorbid depression and OCPD.^{11,38,39} OCD hoarding patients also scored higher on work, social, and family disability, although these scores may reflect the greater severity of OCD in these patients.

Several authors have proposed psychodynamic and sociocultural factors that may contribute to hoarding.⁴ One such theory has posited a relationship between childhood

Table 6. Temperament and Character Inventory (TCI) Scores for Patients With Obsessive-Compulsive Disorder (OCD) With and Without Hoarding Symptoms^a

Item	OCD With Hoarding (N = 24)	OCD Without Hoarding (N = 105)	F	p
Novelty seeking	18.13 (7.22)	16.69 (6.11)	0.63	NS
Harm avoidance	24.00 (5.72)	21.97 (7.68)	3.58	NS
Reward dependence	22.42 (5.28)	22.50 (4.11)	1.23	NS
Self-directedness	21.96 (9.80)	25.19 (8.49)	0.38	NS
Cooperativeness	27.88 (6.29)	29.08 (5.31)	1.36	NS
Self-transcendence	15.64 (6.71)	14.27 (6.34)	0.00	NS

^aAll values are mean (SD) scores; Ns reflect the number of patients who completed the TCI.

Abbreviation: NS = nonsignificant.

Table 7. COMT Genotype in an Afrikaner Subset of Patients With Obsessive-Compulsive Disorder (OCD) With Hoarding Versus OCD Without Hoarding Versus Controls^a

Genotype	OCD With Hoarding, N (N = 18)	OCD Without Hoarding, N (N = 71)	Controls, N (N = 81)
H/H (val/val)	0	15	18
H/L (val/met)	11	41	50
L/L (met/met) ^b	7	15	13

^a $\chi^2 = 10.72$, p = .03.

^bOCD with hoarding vs. OCD without hoarding: $\chi^2 = 8.44$, p = .02; OCD with hoarding vs. controls: $\chi^2 = 10.41$, p = .005.

deprivation and subsequent hoarding.^{40,41} While it is possible that some forms of childhood interpersonal trauma may contribute to the pathogenesis of OCD,⁴² the data here do not suggest a specific association between childhood trauma and subsequent hoarding in OCD patients. In addition, temperament and character profiles did not differ between hoarders and nonhoarders in our sample.

It has been suggested that patients with hoarding behaviors are more difficult to treat with psychotherapy because they do not habituate easily to exposure⁴³ and they display perfectionistic behaviors and magical ideas about discarding that interfere with usual behavioral treatments for OCD.⁴⁴ In addition, it has been argued that hoarding is associated with poor insight⁷ and with worse response to treatment with SSRIs than other OCD symptom dimensions.^{9,10} In our dataset, although findings were

Table 8. Allele Frequencies of the *COMT* Polymorphism in an Afrikaner Subset of Patients With Obsessive-Compulsive Disorder (OCD) With Hoarding Versus OCD Without Hoarding Versus Controls^a

Allele	OCD With Hoarding (N = 18)	OCD Without Hoarding (N = 71)	Controls (N = 81)
<i>H</i> (high activity)	11 (30.56%)	71 (50%)	86 (53.09%)
<i>L</i> (low activity) ^b	25 (69.44%)	71 (50%)	76 (46.91%)
Total	36	142	162

^a $\chi^2 = 6.16$, $p < .05$.

^bOCD with hoarding vs. OCD without hoarding: $\chi^2 = 4.49$, $p = .03$;
OCD with hoarding vs. controls: $\chi^2 = 6.13$, $p = .01$.

in this direction, statistical significance was not reached. Retrospective data collection of response characteristics may have decreased statistical power.

Preclinical,⁴⁵ nonclinical,³ and clinical^{10,11} studies suggest that genetic factors play a role in mediating hoarding behaviors, and there is also evidence of dopaminergic involvement.⁴ As noted before, the data here indicated that in subjects of Afrikaner descent the *met/met* (*L/L*) genotype of the *COMT Val158Met* polymorphism was significantly more common in the OCD hoarding group. That this finding did not hold in the sample as a whole suggests that this genotype may only be relevant to some groups of OCD patients with hoarding, or that the Afrikaner population has more power to detect these differences due to a decrease in the genetic variability of the group. In addition, although the *COMT L/L* genotype has been implicated as a susceptibility factor in a North American male OCD sample,³⁴ these results were not replicated in our previous analysis of Afrikaner OCD⁴⁶ or in a recent meta-analysis of *COMT* in OCD.⁴⁷ It is possible that *COMT* enzyme levels do not play a role in OCD in general, but rather play a role in particular subgroups or subtypes of OCD.

The limitations of the current data should be emphasized. The analysis focused on current rather than lifetime hoarding symptoms. The advantage of this strategy is arguably increased reliability of symptom ascertainment, but the potential disadvantage is that it does not validly address the genetic underpinnings of the relevant symptomatology. Assessment of whether patients were of Afrikaner descent was done with self-report measures; however, the use of self-reports may not be entirely reliable. An ordinal rather than a categorical measure of hoarding was used, which may have decreased power.⁴⁸ In addition, the negative genetic associations reported may simply reflect insufficient power to assess smaller contributions from a range of other candidate genes or the complexity of the pathogenesis of OCD (with a range of other genes and epistatic interactions possibly playing an important role). Further work is needed in order to determine the nature of the genetic contributions to OCD patients with hoarding symptoms, as well as to hoarding symp-

toms in disorders other than OCD. Lastly, in view of the hypothesis-generating nature of the current article, we did not correct for multiple testing; the true significance of the genetic tests is thus unknown.

Nevertheless, the findings here are consistent with the hypothesis that hoarding represents a unique symptom subtype in OCD, with a distinctive clinical and psychobiological profile. In particular, hoarding is associated with increased severity of OCD, greater comorbidity, increased disability, and, in the Afrikaner subset, a functional variant of the *COMT* gene. Further work is needed to replicate the genetic findings here and to elucidate fully the psychobiological mechanisms responsible for hoarding.

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