

Obsessions and Compulsions in Anorexia Nervosa Subtypes

Katherine A. Halmi,^{1*} Suzanne R. Sunday,¹ Kelly L. Klump,² Michael Strober,³ James F. Leckman,⁴ Manfred Fichter,⁵ Allan Kaplan,⁶ Blake Woodside,⁶ Janet Treasure,⁷ Wade H. Berrettini,⁸ Mayadah Al Shabboot,⁹ Cynthia M. Bulik,¹⁰ and Walter H. Kaye¹¹

¹New York Presbyterian Hospital-Westchester Division, Weill Medical College of Cornell University, White Plains, New York

²Department of Psychiatry, Michigan State University, East Lansing, Michigan

³Neuropsychiatric Institute and Hospital, School of Medicine, University of California at Los Angeles, Los Angeles, California

⁴Child Study Center, Yale University School of Medicine, New Haven, Connecticut

⁵Klinik Roseneck, Hospital for Behavioral Medicine, Prien Am Chiemsee, Germany

⁶Department of Psychiatry, The Toronto Hospital, Toronto, Canada

⁷Institute of Psychiatry, Maudsley and Bethlem Royal Hospital, London, England

⁸Department of Psychiatry, University of Pennsylvania, School of Medicine, Philadelphia, Pennsylvania

⁹The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania

¹⁰Virginia Institute for Psychiatric and Behavioral Genetics, Department of Psychiatry, Virginia Commonwealth University, Richmond, Virginia

¹¹Eating Disorder Module, Western Psychiatric Institute and Clinic, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania

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Abstract: Objective: *Obsession and compulsions in anorexia nervosa (AN) patients are often confused with the preoccupations and rituals that are characteristic of obsessive-compulsive disorder (OCD). We examined the type and frequency of characteristic OCD obsessions and compulsions in a large sample of AN patients. Method:* In personal interviews with 324 AN patients, we assessed lifetime histories of eating disorder symptomatology and obsessive-compulsive behaviors with valid semistructured interviews. Checklist category sums on the Yale-Brown Obsessive Compulsive Scale were compared between AN and OCD subjects using generalized estimating equations. **Results:** Lifetime obsessions and compulsions occurred in 68% of the AN restricting type and in 79.1% of the AN binge/purge type. The AN subgroups did not differ from OCD controls in frequency of obsessions in the symmetry and somatic categories or in the compulsion categories of ordering and hoarding. In all other categories, the AN subgroups had a significantly lower frequency compared with the OCD

*Correspondence to: Katherine A. Halmi, M.D., Eating Disorders Program, 21 Bloomingdale Road, White Plains, NY 10605. E-mail: kah29@cornell.edu

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controls. Discussion: Some common phenotype characteristics shared by most AN and OCD patients suggest these disorders may share common brain behavioral pathways. However, the lack of complete overlap indicates they most likely have different loci of pathology within those pathways. © 2003 by Wiley Periodicals, Inc. Int J Eat Disord 33: 308–319, 2003.

Key words: *obsession; compulsion; anorexia nervosa; Yale-Brown Obsessive Compulsive Scale*

INTRODUCTION

The obsessive preoccupations of anorexia nervosa (AN) patients with thinness and their ritualistic behaviors of eating and exercising to prevent weight gain have inspired comparisons with the obsessions and compulsions of obsessive-compulsive disorder (OCD). Two studies from three decades ago found that more severe non-eating disorder obsessive-compulsive behaviors were associated with a poor outcome in AN patients (Halmi, Brodland, & Loney, 1973; Samuel-Lajeunesse, 1967). More recently, Holden (1990) compared the phenotypic characteristics of AN and OCD symptomatology. He noted that the obsessions and compulsions of OCD patients are egodystonic whereas the preoccupations and rituals of AN patients are largely egosyntonic. More simply stated by Mazure, Halmi, Sunday, Romano, and Einhorn (1994), phobic thoughts of food and weight repeatedly enter the mind of AN patients, but not necessarily against their will. Although these thoughts or preoccupations may be distressing, they are not regarded as senseless. AN subjects feel compelled to perform these rituals are behaviors, even though these behaviors may lead to anxiety. However, they are not regarded as unwanted. This is in contrast to typical obsessions and compulsions unrelated to eating, which also may occur in AN patients (Bastiani et al., 1996).

Only two studies have assessed comparatively the frequency of specific types of obsessions and compulsions in AN and OCD patients (Bastiani et al., 1996; Matsunaga et al., 1999). In both, sample sizes were small and the interviews for obsessions and compulsions were conducted by one of the authors who was not blind to the hypothesis of the study. Both studies found symmetry obsessions to be the most common obsessions in AN patients, occurring in 68.8% of AN patients in one study (Bastiani et al., 1996) and in 72% of AN patients in the other study (Matsunaga et al., 1999). Ordering and arranging compulsions were present in 68.8% of AN patients in the Bastiani et al. study and in 67% of AN patients in the Matsunaga et al. study. The frequency of other types of obsessions and compulsions among the AN patients differed in prevalence between these two studies. For example, Matsunaga et al. found contamination obsessions in 56% of AN patients compared with 44% in Bastiani et al. study. Rereading/rewriting compulsions were present in 50% of AN patients in the Bastiani et al. study, but they were not mentioned in the Matsunaga et al. study.

The current study analyzes dimensional structures of obsessive and compulsive symptom categories across two large cohorts of patients to more definitively assess the distinction between obsessions and compulsions in AN and OCD patients. Specifically, it examines and compares the type and frequency of obsessions and compulsions in AN and OCD patients using the Yale-Brown Obsessive Compulsive Scale (YBOCS; Goodman, Price, Rasmussen, Mazure, Fleishmann, et al., 1989). The AN patients were recruited for participation in a multinational study on the genetics of eating disorders. The goals of this multinational study are to map loci influencing susceptibility to AN and

bulimia nervosa and to identify behavioral phenotypes associated with genetic heterogeneity in these syndromes (Kaye et al., 2000).

METHODS

Subjects

AN Subjects

Participants had a history of AN and were participating in an international, multi-center study funded by the Price Foundation to examine the genetic basis of AN. Specific details of the study background, methods, and proposed genetic analyses have been described by Kaye et al. (2000).

Relative pairs affected with AN and specified eating disorders were recruited through clinic services and advertising at seven sites in North America and Europe including the University of Pittsburgh (Pennsylvania), Weill Medical College of Cornell University (New York), the University of California at Los Angeles, the University of Toronto (Canada), the Maudsley Hospital (London), Roseneck Hospital affiliated with the University of Munich (Germany), and the University of Pennsylvania. All participants gave informed consent as approved by the internal review board of each study center.

During the first contact with the initial respondents, the participants were questioned about eating disorders in their first through fifth-degree relatives. If it appeared that a relative might be affected, permission to contact said person was obtained. All participants were required to meet modified AN criteria (i.e., amenorrhea was not required) as outlined in the 4th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association [APA], 1994). Affected status in relatives included DSM-IV (Halmi et al., 2000) criteria for AN, bulimia nervosa, or eating disorder not otherwise specified. Additional proband specific requirements were the onset of AN before age 25 and no history of regular binge eating, obesity, serious medical illnesses, psychotic disorder, bipolar disorder, or known genetic disorder. Eligibility status of relatives also required no history of obesity, serious medical illnesses, psychotic disorder, bipolar disorder, or known genetic disorder. If these criteria were met, written informed consent was obtained and the proband and relative were enrolled in the study.

In a previous analysis of perfectionism in this cohort of AN patients (Halmi et al., 2000), patients were subgrouped by restricting (ANR), purging, and binge-purging (ANBP) subtypes because there are differences in personality structure among these three groups (Garner, Garner, & Rosen, 1993). In the current study of obsessions and compulsions, there were no differences between the purging and binge-purging subtypes. As a result, they were combined to obtain greater statistical power. Assessments of obsessions and compulsions were made for 324 AN patients.

All subjects in the analyses were females with a history of AN: 147 were ANR (i.e., subjects who do not binge or purge) and 177 were ANBP (i.e., subjects who binge and/or purge). Eating disorder diagnoses were established using the Structured Interview of Anorexia Nervosa and Bulimia Syndromes (SIAB; Fichter, Herpetz, Quadflieg, & Herpetz-Dahlmann, 1998).

Obsessive-Compulsive Control Subjects

The primary goal of the Price Foundation genetic study of AN is to use family-based association and linkage methods to identify susceptibility genes for the development of

AN. Community control data are not required for these types of analyses. The exclusive focus of the Price Foundation study, as originally conceived, was to ascertain and assess biologic relatives affected with eating disorders. Given this ascertainment strategy, we did not have access to community control women directly matched to the women under investigation. Consequently, for the current study, we compared YBOCS scores in our subjects with that of a clinic sample of OCD patients, a subset of female subjects ($n = 116$) reported by Leckman et al. (1997). These subjects had no tic disorder or Tourette's syndrome. Checklist category total scores were available for all of these subjects.

Measures

SIAB

Lifetime histories of modified AN in probands and affected relatives were assessed with the SIAB (Fichter et al., 1998). The SIAB is a semistructured clinical interview designed to gather detailed information on weight and eating history to establish DSM-IV eating disorder diagnoses (APA, 1994).

YBOCS

OCD symptoms were assessed using the YBOCS (Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989; Goodman, Price, Rasmussen, Mazure, Fleishmann, et al., 1989). Obsessive thoughts and rituals related to food, eating, calories, weight, or shape were excluded from the YBOCS. Therefore, core eating disorder symptomatology was not counted on the YBOCS checklist. Endorsed somatic obsessions and checking were unrelated to weight and shape.

The YBOCS is a reliable (Goodman, Price, Rasmussen, Mazure, Fleishmann, et al., 1989) and valid (Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989) semistructured interview. First, a symptom checklist for both obsessions and compulsions is generated for both current and lifetime symptoms. Second, process-oriented questions are asked to assess their severity and clinical significance. For this study, subjects who had ever had any obsessive or compulsive symptoms were asked when the symptoms were worst and the questions were asked only for that time period.

Training Procedures

The training procedures used for the SIAB and YBOCS in the current study are described in detail by Kaye et al. (2000) and are only summarized here. Clinical interviewers were trained extensively on the administration of these instruments by (1) viewing videotapes of trained raters administering the SIAB and YBOCS, (2) scoring separate sets of videotapes at accepted standards of accuracy, and (3) taping their own practice interviews and evaluating them for accuracy. Subsequent to this training, every 10th SIAB and YBOCS from each rater was audiotaped for review by the project coordinator of the data and administrative core at the Pittsburgh site. In addition, interviewers at each site blindly rated videotaped interviews at 3-month intervals to ensure rating consistency across sites. These interviews were then scored independently by the project coordinator of the data core.

Several independent confirmations of the eating disorder diagnoses obtained from the SIAB were made to further ensure their accuracy. First, all eating disorder diagnoses were confirmed by the principal investigator at each satellite site after reviewing the SIAB. Second, the project coordinator of the data core independently reviewed every participant's SIAB to confirm diagnoses and scoring accuracy.

Statistical Analysis

Variable Codings

YBOCS total scores (i.e., a sum of the process-oriented questions for obsessions and compulsions) were computed and subjects with zero scores were excluded from further analyses. This was done to compare OCD symptomatology in AN and OCD patients. For all YBOCS analyses, ANR and ANBP subjects were analyzed separately. Checklist data were analyzed similarly to the procedure of Leckman et al. (1997). Specifically, within each of the eight obsession and seven compulsion checklist categories (excluding miscellaneous obsessions and compulsions), the number of lifetime symptoms were summed. However, two exceptions to this general rule should be noted. First, sexual obsessions were coded as dichotomous (i.e., present vs. absent) rather than continuous variables due to their extremely low endorsement in the AN sample. Second, symmetry obsessions were coded dichotomously because the two types of symmetry obsessions (i.e., with and without magical thinking) are orthogonal in nature.

Comparisons between AN and OCD Subjects

Differences in age and YBOCS total scores and checklist category sums were compared between AN and OCD women using generalized estimating equations (GEE; Diggle, Liang, & Zeger, 1994; Liang & Zeger, 1986; Zeger & Liang, 1986). GEE is a statistical approach based on regression techniques that is used to investigate correlated data, such as panel studies and the affected relative-pair data used in the current study. In such datasets, the assumption of independent observations is violated because paired, or clustered, data are collected. In the GEE method, the correlated data are modeled using the same link function, the same linear predictor setup, and the same variance function as is used with a generalized linear model in the independent case. However, in the GEE approach, the covariance structure of the correlated measures is also modeled. Specifically, using the GEE method, the existence of a relationship between observations in a particular cluster is assumed, whereas no relationship is assumed between observations of separate clusters. The relationships among observations within a cluster are then estimated by the GEE method and treated as a nuisance variable in analyses. There are several choices for the form of this working correlation matrix, including a fixed correlation matrix, the identity matrix, an exchangeable correlation matrix, and an unstructured correlation matrix.

In the AN sample in the current study, biologically related family members comprised each cluster in the GEE analyses. However, because family members of varying relatedness were included (i.e., first, second, and third-degree relatives as well as unrelated controls), the GEE analyses were done in two steps. First, models were fit to the YBOCS checklist category data via the GEE method for probands and their siblings only using the exchangeable working correlation matrix to obtain an estimate of the familial correlation among these first-degree relatives. Second, models were refit to the entire dataset of relatives and unrelated controls using familial correlations estimated from the probands and siblings as the user-defined working correlation matrix. The model parameters and statistics from these models were then used as the final solution. This approach to the analyses is conservative, as the proband/sibling correlations used are likely overestimates of the expected correlations among clusters of unrelated individuals and second and third-degree relatives. Such overestimation is likely to result in fewer rather than more significant findings.

For the analyses in the current study, different models were specified depending on the variables under study (i.e., dichotomous or symptom, counts). A logit model was

fitted to dichotomous variables (sexual, symmetry, and hoarding obsessions; counting, ordering, and hoarding compulsions), using the GEE method. A Poisson model was used for all other checklist categories.

Several useful statistics were generated by the GEE method and used in the current study. The Score test was used for testing the significance of each independent variable in the model. GEE were used to estimate means or odds ratios (OR) and their respective 95% confidence intervals (CIs), adjusting for cluster relationships and the covariates in the model. Contrasts were then conducted on the ORs for checklist category sums to examine group differences on dependent measures, using the Score test to determine the statistical significance of these contrasts.

As with other types of statistical analyses, study group differences in demographic characteristics or ascertainment strategies can have significant effects on the GEE results. Consequently, we examined the effects of potential age differences and differences across data collection sites on the YBOCS group analyses. However, because the OCD women were not ascertained from the same sites as the AN women, we could not examine all of these covariates in the same analyses. Instead, we conducted two separate sets of GEE analyses. In Model 1, we examined YBOCS score differences between AN and OCD subjects using age (which was available for both sets of subjects) and Age \times Diagnosis (i.e., ANR, ANBP, OCD) interactions as covariates.

In Model 2, we examined YBOCS score differences across the two AN subtypes, excluding the OCD women, using the site at which data were collected (center), diagnosis, and the interaction between center and diagnosis as covariates in the analyses. Age was not entered as a covariate in this model. Results from Models 1 and 2 were then compared to determine if the inclusion of additional covariates influenced the results of the contrasts comparing AN subtypes.

An alpha level of $p < .05$ was used for analyses of main effects, whereas an alpha level of $p < .01$ was used for contrasts between groups to control for multiple comparisons. For analyses of the checklist data, the term *significant* is used when the 95% CIs of the ORs do not include 1.0. All statistical analyses were conducted using the software package SAS Version 7.0 GENMOD procedure (SAS, 1996).

RESULTS

Descriptive Information

The majority of subjects had lifetime obsessive or compulsive symptoms. Of the ANR subjects, 100 (68.0%) had at least one obsession or compulsion and 140 (79.1%) of the ANBP subjects had at least one of these symptoms. All subsequent data will be presented only for the 100 ANR and the 140 ANBP subjects with lifetime obsessive or compulsive symptoms.

Of the ANR patients with lifetime obsessions or compulsions, all but 3 (97%) had obsessions and all but 4 (96%) had compulsions. For ANBP subjects, 137 of the 140 (98%) had obsessions and 129 (92%) had compulsions. Lifetime worst obsession scores were 10.03 (± 4.60) for ANR and 10.56 (± 4.53) for ANBP. Compulsion scores were 10.62 (± 4.58) for ANR and 11.39 (± 5.11) for ANBP. There were no significant differences between the AN subgroups on the YBOCS total scores ($\chi^2 = 1.04$, $df = 1$, $p = .307$).

There was a significant difference between the groups in age ($\chi^2 = 24.39$, $df = 2$, $p < .0001$). OCD women were significantly older ($M = 34.82$, $SE = 1.09$) than women in

either of the AN subgroups (ANR mean age = 27.93, $SE = 1.51$; ANBP mean age = 28.37, $SE = .78$; OCD mean age = 34.57, $SE = 1.07$; OCD vs. ANR, $\chi^2 = 12.99$, $df = 1$, $p = .0003$; OCD vs. ANBP, $\chi^2 = 17.61$, $df = 1$, $p < .0001$). The difference in age between the AN subgroups was not significant. Results from Models 1 and 2 were identical for all of the YBOCS checklist categories, indicating that the AN subtype findings from Model 1 were relatively robust with respect to age or location of data collection. In addition, there were no significant effects of age. Because of the consistency across models, only results from Model 1 are presented in the tables and in the text.

YBOCS Category Checklist

Table 1 shows the frequency of endorsement of YBOCS obsession and compulsion categories and Score statistics that indicate the overall effects of diagnosis. Aggressive, contamination, somatic, and symmetry obsessions, as well as cleaning, checking, repeating, and ordering compulsions, were prevalent among all groups. However, Score statistics indicate that there was a significant diagnosis effect for almost all of the obsession and compulsion categories examined, indicating significant differences across OCD, ANR, and ANBP women in the frequency of symptoms endorsed. ANR women had significantly lower scores than the OCD group for all obsession checklist categories, except those of symmetry and somatic obsessions, and for all compulsion checklist categories, except those of checking, ordering, and hoarding. ANBP had significantly lower scores than the OCD group for aggressive, contamination, sexual, and religious obsessions, and for repeating and counting compulsions. There were no significant differences between ANR and ANBP women.

The ORs directly comparing the frequency of obsessions and compulsions in the three study groups are depicted in Table 2. OCD women were more likely to endorse almost all types of obsessions and compulsions relative to ANR and ANBP women. Specifically, OCD women were approximately 1.5–7 times more likely to endorse aggressive, contamination, sexual, and religious obsessions, and checking, repeating, and counting compulsions, than both ANR and ANBP women. In addition, OCD women were more than twice as likely to endorse hoarding obsessions relative to ANR women and were 1.3 times as likely to endorse washing compulsions relative to ANBP women. Nonsignificant contrast results comparing the frequency of symptoms between ANR and ANBP women indicate that these two AN subtypes have relatively similar OCD symptom profiles.

DISCUSSION

This study represents the largest assessment of obsessions and compulsions in AN subjects. The core obsessive-compulsive symptoms of the AN subgroups were comparable with factors identified in previous studies of OCD patients with the YBOCS checklist (Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989; Goodman, Price, Rasmussen, Mazure, Fleishmann et al., 1989).

The lifetime worst obsession and compulsion scores in AN patients were almost identical to those obtained in the small sample of acutely ill AN patients in the Bastiani et al. study (1996). The YBOCS scores in the study by Matsunaga et al. (1999) were slightly higher for both obsessions and compulsions in both the ANR and ANBP groups. In this later study, again with a very small sample size of ANR and ANBP patients ($n = 16$ for both groups), the patients were studied when acutely ill and at low body mass

Table 1. Frequency of item endorsement of YBOCS obsessions and compulsion categories among AN and OCD women

Category	AN Restricting Subtype (n = 99) ^a		AN Binge/Purge Subtype (n = 140)		OCD Women (n = 116)		Overall χ^2 for Odds Ratios
	n	%	n	%	n	%	
Obsessions							
Aggressive obsessions	54	53.5	97	69.3	92	79.3	35.57*
Harm self	18	18.2	41	29.3			
Harm others	9	9.1	22	15.7			
Violent images	19	19.2	33	23.6			
Blurring out obscenities or insults	8	8.1	15	10.7			
Other embarrassing things	11	11.1	24	17.1			
Acting on unwanted impulses	9	9.2	18	12.9			
Stealing	5	5.1	14	10.0			
Responsible for accident	9	9.1	21	15.0			
Responsible for terrible things	28	28.3	59	42.1			
Other aggressive	2	2.0	4	2.9			
Contamination obsessions	50	49.5	76	54.3	81	69.8	9.98*
Bodily wastes	21	21.2	24	17.1			
Dirt or germs	29	29.3	50	35.7			
Environmental contaminants	6	6.1	6	4.3			
Household cleansers/solvents	7	7.1	9	6.4			
Animals	16	16.2	29	20.7			
Sticky substances or residues	19	19.2	28	20.0			
Getting ill from contaminant	10	10.1	18	12.9			
Contaminating others	5	5.1	11	7.9			
Feel of contamination	3	3.0	0	0.0			
Other contamination	3	3.0	2	1.4			
Sexual obsessions	9	9.1	8	5.7	36	31.0	26.01*
Forbidden/perverse sex	9	9.1	4	2.9			
Content involving children/incest	5	5.1	3	2.1			
Content involving homosexuality	1	1.0	2	1.4			
Aggressive sex	3	3.0	2	1.4			
Other sexual	0	0.0	1	0.7			
Religious obsessions	23	23.2	31	22.1	56	48.3	19.24*
Sacrilege/blasphemy	4	4.0	4	2.9			
Morality	21	21.2	27	19.3			
Other religious	2	2.0	2	1.4			
Symmetry obsessions	51	51.5	80	57.1	66	56.9	.76
With magical thoughts	11	11.1	24	17.1			
Without magical thoughts	41	41.4	56	40.0			
Hoarding obsessions	16	16.2	29	20.7	36	31.0	8.13*

(Continued)

Table 1. Continued

Category	AN Restricting Subtype (n = 99) ^a		AN Binge/Purge Subtype (n = 140)		OCD Women (n = 116)		Overall χ^2 for Odds Ratios
	n	%	n	%	n	%	
Somatic obsessions	36	36.3	57	40.7	52	44.8	1.02
Illness or disease	16	16.2	35	25.0			
Body part or aspect of appearance	24	24.2	40	28.6			
Other somatic	3	3.0	3	2.1			
Compulsions							
Cleaning compulsions	44	44.4	84	60.0	78	67.2	11.66*
Excessive handwashing	20	20.2	29	20.7			
Excessive grooming, etc.	30	30.3	53	37.9			
Household items or objects	21	21.2	48	34.3			
Removing contaminants	5	5.1	15	10.7			
Other cleaning	1	1.0	0	0.0			
Checking compulsions	64	64.6	94	67.1	98	84.5	8.31*
Locks, windows, stove, etc.	42	42.4	59	42.1			
Did not harm others	10	10.1	10	7.1			
Did not harm self	1	1.0	3	2.1			
Nothing terrible happened	11	11.1	29	20.7			
Did not make mistake	38	38.4	53	37.9			
Somatic	14	14.1	29	20.7			
Other checking	5	5.1	2	1.4			
Repeating compulsions	41	41.4	51	36.4	69	59.5	20.58*
Rewriting or rereading	35	35.4	45	32.1			
Routine activities	12	12.1	11	7.9			
Other repeating	1	1.2	0	0.0			
Counting compulsions	23	23.2	31	22.1	50	43.1	14.21*
Ordering compulsions	49	49.5	81	57.9	51	44.0	5.35
Hoarding compulsions	13	13.1	31	22.1	16	13.8	3.93

Note: AN = anorexia nervosa; OCD = obsessive-compulsive disorder.
* $p < .05$.

^aCategory checklist data were unavailable for one subject.

Table 2. Odds ratios and contrast chi-square tests ($df = 1$) for YBOCS checklist categories

Checklist Category	OCD Comparison vs. ANR			OCD Comparison vs. ANBP			ANBP vs. ANR		
	Odds Ratio	CI ^a	χ^2	Odds Ratio	CI ^a	χ^2	Odds Ratio	CI ^a	χ^2
Obsessions									
Aggressive obsessions	2.47*	1.79–3.40	33.67	1.72*	1.36–2.08	17.37	1.44	1.00–2.07	4.16
Contamination obsessions	1.53*	1.12–2.08	7.76	1.47*	1.10–1.96	7.32	1.04	.73–1.47	.04
Sexual obsessions	3.98*	1.83–8.65	14.29	7.76*	3.36–17.96	6.22	.51	.19–1.39	1.70
Religious obsessions	1.89*	1.24–2.89	9.97	2.35*	1.60–3.46	19.05	.80	.50–1.30	.78
Symmetry obsessions	1.25	.73–2.16	.66	1.04	.64–1.70	.02	1.21	.73–2.00	.52
Hoarding obsessions	2.58*	1.13–5.07	8.11	1.65	.93–2.94	2.92	1.56	.80–3.05	1.68
Somatic obsessions	1.13	.80–1.59	.48	.97	.71–1.32	.04	1.16	.86–1.57	.95
Compulsions									
Washing compulsions	1.67*	1.22–2.27	11.43	1.30	1.04–1.64	4.99	1.28	.93–1.75	2.48
Checking compulsions	1.36*	1.07–1.73	6.60	1.30*	1.05–1.61	6.05	1.04	.81–1.34	.10
Repeating compulsions	1.69*	1.24–2.30	11.67	1.95*	1.50–2.71	20.40	.84	.61–1.16	1.09
Counting compulsions	2.51*	1.37–4.60	9.40	2.75*	1.58–4.77	13.04	.91	.49–1.70	.09
Ordering compulsions	.80	.46–1.39	.60	.57	.35–.92	5.14	1.42	.85–2.35	1.78
Hoarding compulsions	1.05	.47–2.33	.01	.56	.29–1.09	3.06	1.88	.90–3.93	3.06

Note: YBOCS = Yale-Brown Obsessive Compulsive Scale; OCD = obsessive-compulsive disorder; ANR = anorexia nervosa-restricting subtype; ANBP = anorexia nervosa-binge-purge subtype.

^a95% confidence intervals based on analysis using generalized estimating equations.

* $p \leq .01$.

index (BMI). Although patients in the current study were at all stages of illness, their rating of worst obsessions and compulsions was remarkably similar to that of AN patients who were studied while acutely ill. There was no significant difference in the current study in the frequency of obsession categories between the ANR and ANBP women.

The AN women in the current study did not differ from OCD controls in the frequency of obsessions in the symmetry and somatic categories, which is consistent with the results reported by Bastiani et al. (1996). Conversely, Matsunaga et al. (1999) reported that the ANR patients had a significantly higher frequency of symmetry obsessions compared with the OCD patients. Their findings from a Japanese sample may indicate ethnic and cultural effects on symptom expression or comorbidity.

In the current study, the greatest frequency of obsessions in patients endorsing at least one obsession occurred in the categories of symmetry (ANR, 51.5%; ANBP, 57.1%), contamination (ANR, 49.5%; ANBP, 54.3%), and aggressive obsessions (ANR, 53.5%; ANBP, 69.3%). The Matsunaga et al. study (1999) also found a significantly greater frequency of aggressive obsessions in the ANBP compared with the ANR subgroups. In the current study, as well as in the Bastiani et al. study, aggressive obsessions were more prevalent in the OCD controls compared with the AN women.

Although there were no differences in the frequency of ordering and hoarding compulsions between the AN and OCD women, the ordering compulsions occurred in slightly more than one half of the women, whereas the hoarding compulsions occurred in less than one fifth of the women. Ordering compulsions were also prominent in the Bastiani et al. and Matsunaga et al. studies. Slightly more than one half of the AN women had cleaning and checking compulsions, but these were significantly more prevalent in the OCD control women. Overall, the AN women were more restricted in type and frequency of obsessions and compulsions compared with the OCD women.

A limitation of the current study is the possible nonrepresentativeness of our AN sample. Familial cases of AN may not be representative of cases of AN selected at random from the general population, which may spuriously inflate the overall prominence of obsessions and compulsions among affected individuals.

The neurobiologic relationships between OCD and eating disorders remain ambiguous. Data from twin studies suggest that genetic vulnerability factors contribute to both AN (Bulik, Sullivan, Wade, & Kendler, 2000; Klump, Miller, Keel, McGue, & Jacono, 2001; Kortegeard, Hoerder, Joergensen, Gillberg, & Kybik, 2001; Wade et al., 2000) and OCD (Leckman, Zhang, Alsobrook, & Pauls, in press). The few family aggregation studies that have been completed suggest that these disorders may be independently transmitted in families (Lilenfeld et al., 1998).

Neuroimaging studies suggest that both disorders have alterations in the frontal cortex and in the subcortical and limbic regions (Kaye et al., 2001; Saxena, Brody, Schwartz, & Baxter, 1998). This frontal-subcortical circuitry contains complex direct and indirect pathways that are responsive to stimulation from both monoamines, serotonin and dopamine. Pharmacologic (DeVeugh-Geiss, 1991; Halmi, 1999) and physiological (Lilenfeld et al., 1998) studies also indicate that alterations in serotonin functional activity are present in both OCD and AN subjects. These common phenotype characteristics, which are shared by most AN and OCD patients, may indicate that these disorders share some common brain behavioral pathways. However, the lack of complete overlap between these disorders suggests that they have different loci of pathology within these pathways.

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