LATENT CLASSES OF WOMEN UNDERGOING INPATIENT

EATING DISORDER TREATMENT

By

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Introduction

The fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)(1.) inadequately captures eating disorder (ED) phenomenology, sparking considerable interest in empirical classification to inform DSM-5. Several recent studies have used latent class or profile analysis to identify unobserved ED classes, in hopes of more validly and usefully conceptualizing people with EDs.(2-31.) The majority of people with EDs receive the relatively uninformative diagnosis of "eating disorder not otherwise specified" (EDNOS), indicating the need for continued empirical work.(32-36.) This study first identifies latent classes of adolescent and adult females with EDs based on ED cognitions and behaviors, then predicts latent class membership based on ED correlates, DSM-IV ED diagnoses, and comorbid psychopathology.

Certain ED profiles repeatedly emerge in latent structure analyses. Empirical support appears to exist for at least three latent classes: (a) a restricting anorexia nervosa group; (b) one to two bulimia nervosa groups, distinguished by severity of psychiatric comorbidity; and (c) an atypical anorexia nervosa group with low ED psychopathology, low BMI, low bingeing and purging, and low psychiatric comorbidity. (for a review, see (24.)) Other latent classes emerge and are differentiated, for example, by exercise habits or personality characteristics, depending on variables of interest.

Using Eating Disorder Inventory-2 (EDI-2)(37; 38.) drive for thinness, body dissatisfaction, and bulimia subscales as indicators, we hypothesized that at least three classes would emerge: an atypical anorexia class with below average levels of each indicator; a high-symptom bulimic class with above average levels of each indicator; and a restricting anorexic class with high ED psychopathology and low bulimic symptoms. We expected the atypical and restricting anorexic classes to have high rates of anorexia

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nervosa restricting type (ANR) and EDNOS, but low rates of anorexia nervosa binge eating / purging subtype (ANBP). We hypothesized high rates of bulimia nervosa purging and nonpurging types (BNP and BNNP) and high ANBP to comprise the high-symptom bulimic class.

The second goal of this study was to identify psychiatric comorbidities and other eating disorder correlates that predicted membership in the latent classes. We expected lower BMI in the atypical and restricting anorexic classes, but acknowledged that BMI differences might not be significant given the overall medical severity of an inpatient sample. Greater diagnostic crossover from restricting to bingeing or purging relative to the converse(39; 40.) suggested a relationship between longer duration of illness and the high-symptom bulimic class. Studies comparing comorbidity across ED diagnoses have shown that obsessive-compulsive disorder (OCD) is both elevated in and predicts development of anorexia nervosa (41; 42.) and that substance abuse is elevated in those with bulimia nervosa or ANBP.(43-45.) Similar levels of other anxiety and depressive disorders present across ED diagnoses.(41.) Based on these findings, we expected elevated OCD in the restricting anorexic latent class and higher substance use or dependence in the bulimic latent class. Because patients with atypical presentations of anorexia nervosa often do not endorse ED psychopathology and tend to be younger,(28; 46.) we expected low endorsement of anxiety, depression, and substance abuse symptoms in the low-symptom class.

<center>Methods</center>

Participants

Participants were 2,434 females undergoing residential ED treatment at a specialized facility in the United States from 2004-2010. Dropped from the analysis

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were the only two child participants (under age 13), 25 cases representing readmissions during the study period, and 183 participants missing data on relevant eating disorder or comorbidity variables.[1] The final sample included 2,247 adolescent and adult females.

Self-reported demographic information also was collected at intake. The sample was minimally diverse, comprised of white (94.7%, n=2066), Latina (2%, n=44), black (0.5%, n=11), Asian or Pacific Islander (0.2%, n=5), and Native American (0.1%, n=2) participants. Five percent did not report ethnicity (5.3%, n=119). Mean age at admission was 23 years old.

Measures

Psychiatrists or psychiatric nurse practitioners determined eating disorder diagnoses and comorbid psychiatric conditions through clinical interviews. EDNOS was the most common diagnosis (30.7%, n=689), though combined subtypes of anorexia formed the largest patient group. ANR formed 25.9% of the sample (n=583), followed by BNP (19.9%, n=448), ANBP (14.6%, n=327), and BNNP (8.9%, n=200). This facility did not treat individuals with the binge eating disorder variant of EDNOS during this time period. Intake interviews also assessed ED correlates such as length of disorder and body mass index (BMI). Psychiatric comorbidity, including substance abuse, was common in this sample. Major depressive disorder was the most prevalent psychiatric comorbidity (54.1%, n=1215) and alcohol was the most frequently abused substance (20.8%, n=468).

Participants reported ED characteristics through the EDI-2, which is a 91-item, self-report questionnaire measuring 11 features of eating disorder psychopathology in

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[1] Methods used to estimate mixture models maximize a conditional likelihood where no distributional assumptions are made about predictors of class membership, and hence missingness on these predictors cannot be accommodated within the model.47. Arminger G, Stein P, Wittenberg J. Mixtures of Conditional Mean- and Covariance-Structure Models. Psychometrika 1999;64:475-494.

individuals at least 12 years old.(37; 38.) Items comprising the 11 subscales are measured on a zero to three-point scale with higher scores indicating greater symptomatology. The research database contained the 11 subscale scores, not individual item responses. This study used drive for thinness, bulimia, and body dissatisfaction subscales. Drive for thinness assesses preoccupation with dieting and weight and fear of weight gain. The bulimia subscale measures bingeing behaviors and cognitions and, to a lesser extent, vomiting cognitions. Body dissatisfaction focuses on concerns about shape and size of particular body parts.

The treatment facility obtained patient consent and de-identified these data before providing them to the authors. The Institutional Review Board of Vanderbilt University approved this study.

Analyses

Latent profile analysis (LPA) was performed using the 2,247 participant scores on body dissatisfaction, bulimia, and drive for thinness as latent profile (or class) indicators. LPA uses maximum likelihood estimation to determine the smallest number of homogenous latent classes that can explain associations among observed continuous variables or indicators.(48.) LPA formally requires local independence, meaning that between-class mean differences fully explain covariance among indicators and no residual associations are allowed among indicators within class.(48.) Because diagnostics indicated high residual covariance among indicators used in these analyses, the restrictive local independence assumption was relaxed, resulting in a finite mixture model.(49.)

Models with one to eight classes were fitted. Bayesian information criteria (BIC), bootstrapped likelihood ratio tests (BLRT), and Vuong-Lo-Mendell-Rubin likelihood

ratio tests (VLMR-LRT) were used to determine the number of classes in the final model. Lower BIC indicates a better fitting model. An alpha of 0.05 was used in BLRT and VLMR-LRT when testing the null hypothesis of no difference in fit between k versus k-1 class models.

Once the optimal number of classes was determined, the model cumulatively incorporated five sets of covariates to determine how well DSM-IV ED diagnoses, ED correlates, and psychiatric comorbidity predicted latent class membership. Likelihood ratio tests evaluated improvement in fit from simpler to more complex models. Odds ratios expressed significance of individual predictors.

Statistical Package for the Social Sciences 19 was used to quantify nominal variables, standardize predictor variables, and sort cases. Latent structure analyses were conducted with Mplus software. (50.) Two hundred sets of random starting values were used to decrease the chance of local maxima.

<div align="center">Results</div>

<u>Unconditional Model</u>

Statistical support emerged for a four-class model, using EDI-2 body dissatisfaction, bulimia, and drive for thinness as indicators in a series of mixture models with one to eight classes. The VLMR-LRT revealed nonsignificant improvement from four to five classes, at which point the BIC also showed a slowing rate of decline. Table 1 shows the information criteria and likelihood ratio tests for one to eight classes.

Table 1: Fit Indices and Likelihood Ratio Tests for Unconditional Model							
		Parametric Bootstrapped Likelihood Ratio Test for k versus k-1 classes			Vuong-Lo-Mendell-Rubin Likelihood Ratio Test for k versus k-1 classes		
Number of Classes in Model	Bayesian Information Criteria	2 Times the Loglikelihood Difference	Difference in number of parameters	p-value	2 Times the Loglikelihood Difference	Difference in number of parameters	p-value
1	43267.000						
2	42218.334	1079.536	4	<0.001	1079.536	4	<0.001
3	41634.292	614.911	4	<0.001	614.911	4	<0.001
4	**41383.772**	**281.390**	**4**	**<0.001**	**281.390**	**4**	**<0.001**
5	41225.730	188.912	4	<0.001	188.912	4	0.144
6	41096.582	160.018	4	<0.001	160.018	4	0.035
7	40982.780	144.671	4	<0.001	144.671	4	0.001
8	40856.214	157.435	4	<0.001	157.435	4	<0.001

<u>Description of latent classes</u>

Figure 1 graphically depicts latent profiles for the best-fitting four-class solution. "Typical Anorexia Nervosa" (typical AN) was the largest class (45.4%, n=1,205), characterized by elevated body dissatisfaction (mean=19.461) and drive for thinness (16.888) and very low bulimia (2.127). "Atypical Anorexia Nervosa" (AAN) was the second largest class (21.0%, n=467) and characterized by well below average scores on body dissatisfaction (7.386) and drive for thinness (3.906) and the near-absence of bulimia (0.958). "Moderate Bulimia Nervosa" (BN-Mod) was the third largest class (17.9%, n=401), characterized by elevated body dissatisfaction (18.095) and drive for thinness (15.081) and moderate bulimia scores (9.849). "Severe Bulimia Nervosa" (BN-Sev) was the smallest class (15.7%, n=354) and characterized by elevated scores on each indicator (body dissatisfaction=18.624, bulimia=16.614, and drive for thinness=15.882).
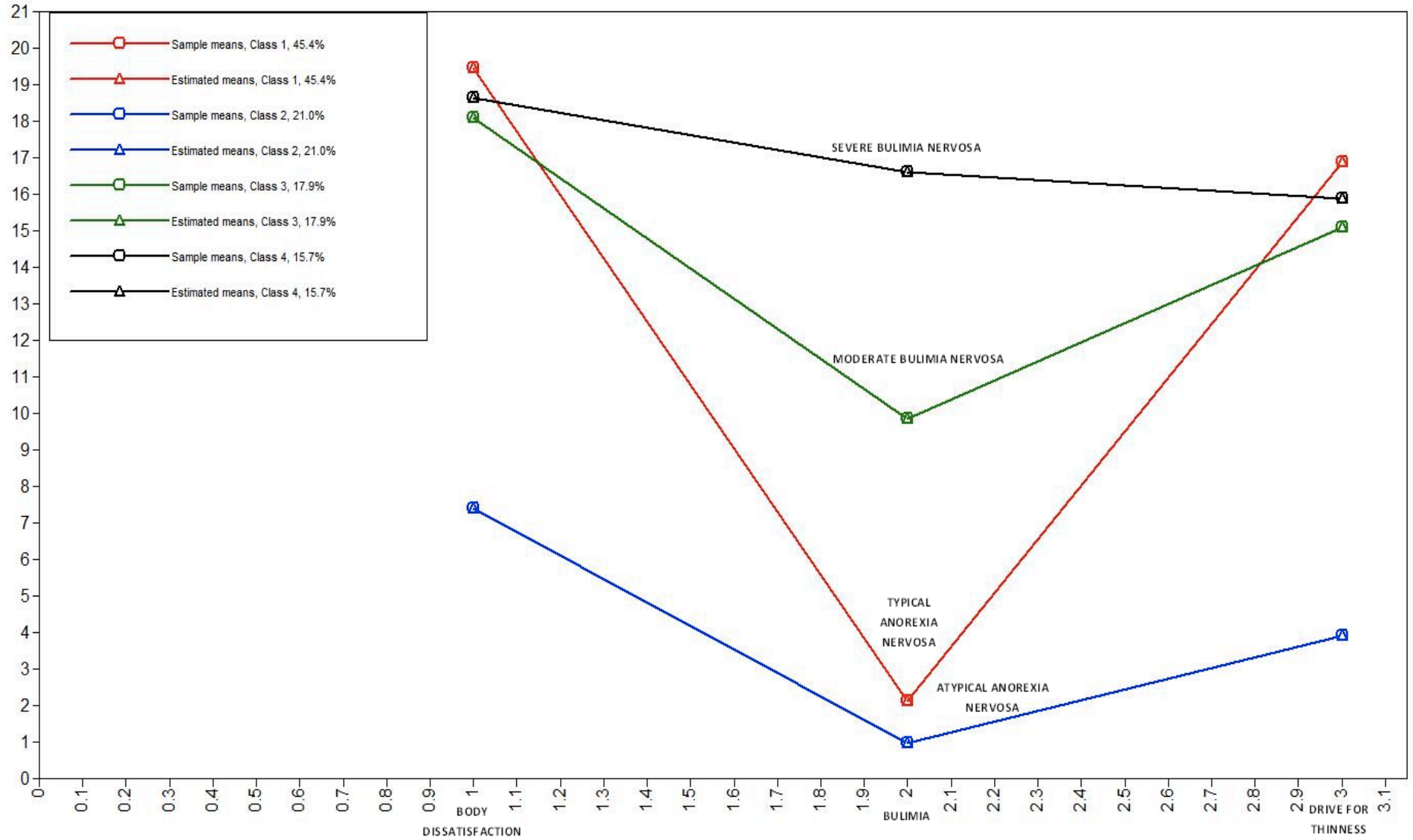
Table 2 provides descriptive information by latent class (using modal class assignment), including percentiles corresponding to indicator means, derived from EDI-2 normative data from ED patients and college students without EDs.(38.) Relative to other ED patients, body dissatisfaction means for the typical AN, BN-Mod, and BN-Sev classes were above the 50th percentile, while drive for thinness means for these classes were above the 70th percentile. Bulimia scores for the BN-Sev class were above the 84th percentile and at approximately the 50th percentile for the BN-Mod class. AAN scored well below the 20th percentile on each indicator, relative to normative ED patients, and near the center of the distribution of scores for college women without eating disorders (body dissatisfaction=47-51%, bulimia=64%, drive for thinness=60%).

		BMI (z-score)	EDI-2 Body Dissatisfaction			EDI-2 Bulimia			EDI-2 Drive for Thinness		
Table 2: Latent Class Descriptors											
Latent Class	N	Mean (SD)	Mean (SD)	% rank among eating disorder patients	% rank among college students without eating disorders	Mean (SD)	% rank among eating disorder patients	% rank among college students without eating disorders	Mean (SD)	% rank among eating disorder patients	% rank among college students without eating disorders
Atypical Anorexia Nervosa	467	-2.038 (1.45)	7.077 (5.571)	18	47	.899 (1.638)	3-5	50-64	3.627 (3.045)	14	55-60
Moderate Bulimia Nervosa	401	-0.640 (1.287)	17.985 (7.313)	53	84	9.825 (2.083)	44-51	96-97	14.948 (4.868)	73	91-94
Severe Bulimia Nervosa	354	-0.357 (1.352)	18.737 (7.388)	53-56	84-86	16.723 (2.227)	84-88	>99	16.000 (4.483)	73-81	96
Typical Anorexia Nervosa	1025	-1.535 (1.344)	19.558 (6.810)	83-85	86-87	2.121 (1.973)	6-7	77-85	16.977 (3.292)	81-88	96-97
Total	2247	-1.294 (1.483)	16.554 (8.342)	47-49	79-82	5.543 (6.057)	21-27	90-93	13.686 (6.430)	53-61	90-91

The conditional mixture model used a multinomial logistic regression specification to predict class membership. Five sets of predictors where incorporated in the following order: (1) DSM-IV ED diagnoses: ANR, ANBP, BNP, BNNP, EDNOS; (2) length of ED and BMI; (3) major depressive disorder, dysthymic disorder, depressive disorder not otherwise specified, post-traumatic stress disorder, anxiety disorder not otherwise specified, obsessive-compulsive disorder, generalized anxiety disorder, social phobia, attention deficit hyperactivity disorder, self-harm, suicide attempt, sexual abuse history; (4) alcohol or cannabis abuse or dependence; (5) EDI-2 perfectionism and maturity fears subscales, which measure the importance of high standards and biological and psychological fears associated with puberty. Loglikelihood ratio tests showed statistically significant improvement with the addition of each set of predictors, except alcohol or cannabis abuse or dependence. Table 3 reports loglikelihood tests for each conditional model, compared to the previous model in the sequence. The final model included all predictors; Table 4 reports odds ratios (OR) associated with each predictor in the final model. Typical AN served as the reference class in these multinomial logistic regressions.

Set	Predictors (each model contains the predictors in current plus previous sets--via hierarchical multinomial logistic regressions)	Bayesian Information Criteria	Loglikelihood	Free Parameters	Likelihood Ratio Difference	Degrees of freedom	p-value
	Table 3: Loglikelihood Ratio Difference Tests for Comparing Conditional Models						
0	None, unconditional model	41383.772	-20610.854	21			
1	DSM-IV ED diagnoses	40330.920	-20038.124	33	1145.46	12	<0.001
2	Length of disorder, BMI	40288.882	-19993.953	39	88.342	6	<0.001
3	Depressive and Anxiety disorders; History of suicide, self-harm, or abuse; ADHD	40386.621	-19903.910	75	180.086	36	<0.001
4	Substance use disorders	40422.602	-19898.748	81	10.324	6	0.112
5	EDI-2 Perfectionism and Maturity Fears	40271.465	-19800.028	87	197.44	6	<0.001

	Atypical Anorexia Nervosa latent class Vs. Typical Anorexia Nervosa class				Moderate Bulimia Nervosa latent class Vs. Typical Anorexia Nervosa class				Severe Bulimia Nervosa latent class Vs. Typical Anorexia Nervosa class			
Table 4: Odds Ratios for Predictors of Class Membership in Final Model												
Predictors	Odds Ratio		Lower 2.5%	Upper 2.5%	Two-Tailed p-value	Odds Ratio		Lower 2.5%	Upper 2.5%	Two-Tailed p-value	Odds Ratio		Lower 2.5%	Upper 2.5%	Two-Tailed p-value
DSM-IV Eating Disorder Diagnoses												
Anorexia Nervosa Binge-eating / Purging type	0.398	*	0.245	0.648	<0.001	14.180	*	5.927	33.925	<0.001	145.549	*	19.779	1071.047	<0.001
Bulimia Nervosa Purging type	2.031		0.966	4.270	0.062	96.241	*	37.368	247.870	<0.001	701.368	*	89.880	5473.041	<0.001
Bulimia Nervosa Nonpurging type	2.145		0.811	5.673	0.124	61.052	*	20.837	178.885	<0.001	773.683	*	95.491	6268.509	<0.001
Eating Disorder Not Otherwise Specified	1.221		0.789	1.889	0.370	3.771	*	1.552	9.167	0.003	15.348	*	2.014	116.989	0.008
Eating Disorder Correlates												
Length of eating disorder (z-score)	1.060		0.900	1.249	0.486	1.187		0.990	1.422	0.064	1.244	*	1.049	1.476	0.012
BMI (zscore)	0.619	*	0.527	0.727	<0.001	1.207	*	1.020	1.427	0.028	1.442	*	1.209	1.720	<0.001
Perfectionism	0.491	*	0.414	0.583	<0.001	1.071		0.894	1.284	0.457	1.206	*	1.010	1.441	0.038
Maturity Fears	0.519	*	0.419	0.644	<0.001	1.061		0.888	1.266	0.516	1.279	*	1.083	1.511	0.004
Psychiatric Comorbidities												
Sexual abuse history	1.272		0.872	1.855	0.212	0.897		0.602	1.337	0.593	0.974		0.669	1.418	0.891

Table 4: Odds Ratios for Predictors of Class Membership in Final Model												
Predictors	Atypical Anorexia Nervosa latent class Vs. Typical Anorexia Nervosa class				Moderate Bulimia Nervosa latent class Vs. Typical Anorexia Nervosa class				Severe Bulimia Nervosa latent class Vs. Typical Anorexia Nervosa class			
	Odds Ratio	Lower 2.5%	Upper 2.5%	Two-Tailed p-value	Odds Ratio	Lower 2.5%	Upper 2.5%	Two-Tailed p-value	Odds Ratio	Lower 2.5%	Upper 2.5%	Two-Tailed p-value
Suicide attempt history	1.079	0.677	1.719	0.750	1.299	0.858	1.966	0.217	0.837	0.517	1.353	0.467
Self-harm history	0.576 *	0.406	0.817	0.002	0.715	0.500	1.023	0.066	0.530 *	0.365	0.769	0.001
Attention Deficit Hyperactivity Disorder	1.225	0.735	2.043	0.436	1.192	0.740	1.920	0.471	1.294	0.804	2.083	0.288
Social Phobia / Social Anxiety Disorder	0.596	0.342	1.038	0.068	0.949	0.569	1.584	0.842	1.098	0.639	1.885	0.736
Generalized Anxiety Disorder	0.623 *	0.435	0.892	0.010	1.482 *	1.007	2.181	0.046	1.222	0.820	1.819	0.324
Obsessive-Compulsive Disorder	0.592 *	0.398	0.881	0.010	0.743	0.493	1.121	0.157	0.591 *	0.386	0.906	0.016
Anxiety Disorder not otherwise specified	0.802	0.580	1.107	0.180	0.975	0.658	1.446	0.900	0.964	0.649	1.432	0.856
Posttraumatic Stress disorder	0.665	0.394	1.121	0.126	0.511 *	0.310	0.841	0.008	0.608	0.366	1.012	0.056
Depressive Disorder not otherwise specified	0.630 *	0.429	0.924	0.018	0.635	0.382	1.057	0.081	0.985	0.587	1.650	0.953
Dysthymic Disorder	1.064	0.609	1.861	0.827	1.225	0.671	2.239	0.509	1.742	0.992	3.057	0.053
Major Depressive Disorder	0.414 *	0.290	0.592	<0.001	0.510 *	0.333	0.780	0.002	0.782	0.502	1.219	0.278

Table 4: Odds Ratios for Predictors of Class Membership in Final Model											
Predictors	Atypical Anorexia Nervosa latent class Vs. Typical Anorexia Nervosa class				Moderate Bulimia Nervosa latent class Vs. Typical Anorexia Nervosa class				Severe Bulimia Nervosa latent class Vs. Typical Anorexia Nervosa class			
	Odds Ratio	Lower 2.5%	Upper 2.5%	Two-Tailed p-value	Odds Ratio	Lower 2.5%	Upper 2.5%	Two-Tailed p-value	Odds Ratio	Lower 2.5%	Upper 2.5%	Two-Tailed p-value
Substance Use Comorbidities												
Alcohol abuse or dependence	1.220	0.803	1.853	0.352	1.459	0.963	2.210	0.075	1.409	0.941	2.109	0.096
Cannabis abuse or dependence	1.105	0.529	2.308	0.790	1.668	0.892	3.121	0.109	1.621	0.858	3.063	0.137

*=significant at .05

DSM-IV Eating Disorder Diagnoses

Composition of the latent classes supported a clear distinction between restricting-only and bulimic groups. Because the DSM-IV ED diagnoses were dependent, in that each participant had one and only one ED diagnosis, DSM-IV ANR functioned as the reference class in this analysis. As shown in Table 4, the odds of being in BN-Mod or BN-Sev versus typical AN were significantly higher for participants with each of the DSM-IV ED diagnoses relative to those with DSM-IV ANR, indicating that few restricting-only participants would fall into the bulimic latent classes. Specifically, the odds of being in BN-Mod relative to typical AN increased significantly for participants diagnosed with ANBP (OR=14.180, p<0.001), BNP (OR=96.241 p<0.001), BNNP (OR=61.052 p<0.001), and EDNOS (OR=3.771, p=0.003), relative to those diagnosed with DSM-IV ANR. The odds of being in BN-Sev relative to typical AN increased significantly for participants diagnosed with ANBP (OR=145.549, p<0.001), BNP (OR=701.368, p<0.001), BNNP (OR=773.683, p<0.001), and EDNOS (OR=15.348, p=0.008), relative to those diagnosed with DSM-IV ANR. The odds of being in AAN versus typical AN were lower (OR=0.398, p<0.001) for participants with ANBP relative to those with DSM-IV ANR. Odds ratios for other ED diagnoses held by AAN members were not significant.

Eating Disorder Correlates

Length of ED was significant only for BN-Sev, for which odds of membership in BN-Sev versus typical AN increased 24.4% (OR=1.244, p=0.012) per year of illness. Higher BMI increased odds of membership in BN-Mod (OR=1.207, p=0.028) or BN-Sev versus typical AN (OR=1.442, p<0.001), but decreased odds of membership in AAN vs. typical AN (OR=0.619, p<0.001). The odds of being in BN-Sev versus typical AN

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increased 20.6% (OR=1.206, p=0.038) per standard deviation increase in Perfectionism and 27.9% (OR=1.279, p=0.004) per standard deviation increase in Maturity Fears. The odds of being in AAN versus typical AN decreased 50.9% per standard deviation increase in Perfectionism (OR=0.491, p<0.001) and 48.1% per standard deviation increase in Maturity Fears (OR=0.519, p<-.001).

Psychiatric Comorbidities

Depressive disorders did not significantly differentiate BN-Sev and typical AN. For those with major depressive disorder, the odds of being in either BN-Mod (OR=0.510, p=0.002) or AAN (OR=0.414, p<0.001) were lower than the odds of being in typical AN. Odds of being in AAN vs. typical AN also were lower for those with depressive disorder not otherwise specified (OR=0.630, p=0.018). Dysthymic disorder odds ratios were not significant.

Anxiety disorders predicted class membership in several ways. For those with OCD, the odds of being in AAN (OR=0.592, p=0.010) or BN-Sev (OR=0.591, p=0.016) were lower, relative to AN. OCD odds ratios for BN-Mod and typical AN did not differ. Those with generalized anxiety disorder were less likely to be in AAN (OR=0.623, p=0.010) and slightly more likely to be in BN-Mod (OR=1.482, p=0.046), compared to typical AN. Finally, posttraumatic stress disorder reduced the odds of membership in BN-Mod (OR=0.511, p=0.008) vs. typical AN. Social phobia and anxiety disorder not otherwise specified did not significantly distinguish among classes.

The odds of being in BN-Sev (OR=0.530, p=0.001) or AAN (OR=0.576, p=0.002), relative to typical AN, were lower for those with a history of self-harm. Sexual abuse history, suicide attempt, attention deficit hyperactivity disorder were not significant predictors of class membership.

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Neither alcohol and cannabis use nor dependence significantly predicted membership in any latent class.

Discussion

This study aimed to identify empirical ED classes in an inpatient, female sample using core ED features of body dissatisfaction, drive for thinness, and bingeing and vomiting cognitions and behaviors. Four latent classes emerged: typical, restricting anorexia nervosa (typical AN), atypical anorexia nervosa (AAN), and two bulimia classes differentiated by EDI-2 Bulimia subscale means (BN-Sev and BN-Mod). These findings support a broad distinction between restricting and bulimic syndromes and emphasize the prevalence of an atypical form of anorexia involving minimal endorsement of ED cognitions and low psychiatric comorbidity. Longer duration of illness predicted membership in the BN-Sev, and OCD was elevated in typical AN and BN-Mod. Substance abuse was not significant.

Classification Considerations

The odds of being in either bulimic latent class were significantly higher for participants with BNP, BNNP, and ANBP. This finding accords with previous analyses supporting a qualitative distinction between ANR and ANBP and a dimensional relationship between ANBP and bulimia nervosa.(51; 52.) However ANBP prognosis is worse than ANR(40.) or bulimia nervosa prognoses(53; 54.) and weight-restored individuals with ANBP (as well as ANR) do not respond to fluoxetine, which can be effective in treating bulimia nervosa.(55.) These factors also necessarily impact the validity and clinical utility of conceptualizing ANBP as a form of bulimia nervosa rather

than a form of anorexia nervosa and indicate the need for further research on differential treatment response of ANBP.

These data indicated that the longer one has an ED, the more likely one is to develop bingeing and purging behaviors. The odds of being in BN-Sev increased by 24.4% for each year of illness, though length of ED did not increase the odds of being in other latent classes. This finding supports the higher rate of diagnostic crossover from ANR to ANBP, BNP, or BNNP, though the converse is less common.(39; 40; 56; 57.)

Atypical Anorexia

The emergence of a relatively large ED inpatient group who endorsed normative levels of ED psychopathology at very low weights emphasizes the need for additional research about whether typical and atypical presentations of anorexia differ on course and outcome. While the prevalence of non-fat phobic or low drive for thinness anorexia has been documented in several contexts, evidence on differential treatment response is limited and mixed.(58-61.) The phenomenon appears to require further research before being merged with typical ANR or extracted from EDNOS as a stand-alone diagnosis.(62.) This endeavor is complicated by the fact that the fear of fat or weight gain is required for a diagnosis of anorexia nervosa, yet it is difficult to differentiate simple absence of this feature from denial, misrepresentation, or inability to recognize or articulate cognitions due to developmental stage.(63.) DSM-5 proposals to provide behavioral alternatives to endorsement of cognitions may address this issue from a functional perspective.(64.)

Comorbidity Findings

OCD was the only depressive or anxiety disorder that differentiated typical AN and BN-Sev. The odds of being in BN-Sev or AAN were lower for those with OCD or self-

harm, relative to typical AN; odds ratios for other depressive and anxiety disorders for these latent classes were not significant. This result is consistent with evidence that OCD is elevated in individuals with anorexia nervosa relative to those with bulimia nervosa or major depressive disorder(41.) and that OCD predicts development of anorexia nervosa but not bulimia nervosa by age 30.(42.) The possibility that individuals with the extreme restricting behaviors seen in anorexia nervosa have an underlying vulnerability to numerous obsessive and compulsive behaviors may signal an important nosological distinction and warrants further research.

Individuals in BN-Mod and BN-Sev were heavier than those in typical AN, while individuals in AAN were lighter. For one standard deviation increase in BMI, the odds of being in either of the latent bulimic classes increased while the odds of being in AAN decreased. This finding is in line with the expectation that higher BMI would accompany greater endorsement of bingeing and supports the validity of the extracted classes. But it should be noted that standardized BMI means for each latent class were below average relative to the general population (see Table 2), meaning that class differences range from underweight to low normal weight and likely are unrepresentative of most people with EDs.

Odds of being in BN-Sev and AAN, relative to typical AN, were lower for those with a history of self-harm. This specific elevation in the typical AN class was an unexpected finding and warrants further attention.

Alcohol and marijuana abuse or dependence failed to predict latent class membership. While studies of substance use in EDs often have found elevations in bulimia nervosa,(45.) others have found equivalent prevalence of lifetime alcohol use in people with anorexia nervosa and bulimia nervosa.(43.) Differences in those studies

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may relate to individuals with ANBP being classified as bulimic or actually developing

bulimia nervosa over the study period; substance use patterns of people with ANBP

resemble those of people with bulimia nervosa and could balance use patterns across

diagnoses.(43.) Additionally, the extremely high mortality rate seen in anorexia nervosa

frequently involves alcohol-related suicide.(53.) This study indicates that substance use

is a general concern for people with any ED presentation, particularly given

compromised physical health.

<u>Strengths & Limitations</u>

Strengths of the study include a large, inpatient sample, which afforded

considerable power to observe differences among severe ED cases, which have low base

rates under current diagnostic criteria.(1.) Analyzing individuals in residential treatment

facilitated measures of numerous comorbid diagnoses and ED correlates. The use of an

inpatient sample also functioned as a limitation in that inpatient participants are likely

to be more medically compromised than those in the community. The use of a private,

specialty treatment facility in the United States also may limit generalizability of

findings, as socioeconomic factors such as cost and ethnicity likely influenced who was

able and willing to access care. For example, ethnic minority Americans are less likely

than white Americans to access care for an ED, notwithstanding similar or elevated

prevalence.(65.) Additionally, this facility did not treat people with binge eating

disorder, limiting generalizability to community samples. Reported diagnoses were

made for clinical rather than research purposes, which may limit their reliability and

consistency. The EDI-2 Bulimia scale primarily assesses cognitions and behaviors about

bingeing rather than purging,(38.) which limited the exploration of varied

compensatory measures used by women with EDs. Finally, latent profile analysis risks identifying quantitative differences among groups as qualitative differences.

Conclusion

The four latent classes identified in this study support a meaningful distinction between restricting anorexic and bulimic syndromes, highlight the need for greater attention to atypical anorexic presentations, and indicate the potential importance of OCD in distinguishing cases. The study lays the groundwork for additional analyses that compare latent classes to DSM-IV diagnoses with respect to treatment outcome and examine temporal stability of latent classes.

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