

Physical and Psychological Morbidity in Adolescents With Atypical Anorexia Nervosa

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abstract

BACKGROUND AND OBJECTIVE: Adolescents with atypical anorexia nervosa (AN) have lost significant weight but are not underweight. This study aimed to describe the physical and psychological morbidity of adolescents diagnosed with atypical AN, and to compare them with underweight adolescents with AN.

METHODS: All first presentations of atypical AN ($n = 42$) and full-threshold AN ($n = 118$) to a specialist pediatric eating disorder program between July 2010 and June 2014 were examined. Diagnosis was assessed by using the Eating Disorder Examination and anthropometric measurement. Psychological morbidity measures included eating and weight concerns, bingeing, purging, compulsive exercise, and psychiatric comorbidity.

RESULTS: Compared with AN, more adolescents with atypical AN were premorbidly overweight or obese (71% vs 12%). They had lost more weight (17.6 kg vs 11.0 kg) over a longer period (13.3 vs 10.2 months). There was no significant difference in the frequency of bradycardia (24% vs 33%) or orthostatic instability (43% vs 38%). We found no evidence of a difference in frequency of psychiatric comorbidities (38% vs 45%) or suicidal ideation (43% vs 39%). Distress related to eating and body image was more severe in atypical AN.

CONCLUSIONS: Atypical AN considerably affects physical and psychological functioning, despite adolescents presenting within or above the normal weight range. There was little evidence that the morbidity of adolescents with atypical AN was any less severe than that of adolescents with full-threshold AN. The findings support the need for vigilance around weight loss in adolescents, regardless of body size.



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WHAT'S KNOWN ON THIS SUBJECT: Adolescents with atypical anorexia nervosa (AN) are presenting to pediatric eating disorder services at an increasing rate. However, little is known about the physical and psychological morbidity of this cohort and how it differs from underweight adolescents with AN.

WHAT THIS STUDY ADDS: Many adolescents with atypical AN are physically unwell and have psychological morbidity as severe as underweight adolescents with AN. Pediatricians should be vigilant about weight loss in adolescents, even when not underweight, as it may indicate a severe eating disorder.

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Eating disorders are known to occur at all weights, including in those who are overweight or obese. A key diagnostic feature differentiating anorexia nervosa (AN) from other eating disorders is that the individual is underweight.¹ However, there is growing evidence that adolescents with restrictive eating disorders who have lost significant weight, but are not underweight, may be just as physically compromised as those who are underweight.^{2,3}

Atypical AN is defined within the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5)¹ as an eating disorder wherein “all of the criteria for anorexia nervosa are met, except that despite significant weight loss, the individual’s weight is within or above the normal range” (p. 353). We have observed a striking increase in this type of presentation among adolescent inpatients. Remarkably, of patients admitted to hospital with restrictive eating disorders, the proportion who were not underweight rose from 8% to 47% over a 6-year period.³ These patients not only had the same spectrum of behaviors and cognitions characteristic of underweight adolescents with AN, but also had a similar profile of acute physical complications. What is not known is whether the physical complications of weight loss are also seen in the broader population of adolescents with atypical AN who present for assessment at specialist pediatric eating disorder services (both inpatient and outpatient), and to what extent psychological morbidity is also apparent. This study therefore aimed to describe the physical and psychological morbidity of adolescents presenting with atypical AN, and to compare their morbidity to those presenting with full-threshold AN.

METHOD

Setting

The Royal Children’s Hospital Eating Disorders Program is a

multidisciplinary specialist program that provides comprehensive inpatient and outpatient care for children and adolescents with eating disorders using a family-based treatment paradigm.⁴ All patients referred to the outpatient program were evaluated by a pediatrician, psychiatrist, nurse, and dietician, and administered standardized psychological measures by trained assessors. Parents were also administered standardized measures and interviewed by a family therapist. Assessments were completed at the time of initial presentation, whether in the outpatient clinic or on the hospital ward. The program has no lower age limit and can assess patients up to 19 years old. Most patients have restrictive eating disorders. Patients are admitted to the inpatient adolescent ward if they are medically unstable according to international criteria.⁵ Regardless of presenting weight, inpatient admissions aim for weight gain to achieve medical stability. Once medically stable, patients are discharged to outpatient treatment within the program.

Study Design

We examined data from all first presentations to the program from July 2010 (when standardized assessments commenced) to June 2014. Parent and patient reports on the Eating Disorder Examination (EDE)^{6–8} were used to assign DSM-5 diagnoses by using the criteria in Supplemental Table 4. Avoidant/restrictive food intake disorder was not included, as the EDE was not designed to assess all criteria for this diagnosis. A weight threshold of $\leq 89\%$ median BMI (mBMI; calculated as current BMI/50th percentile BMI for age and gender⁹ $\times 100$) was used to identify AN cases. For those $\geq 90\%$ mBMI, weight loss of $\geq 10\%$ body weight identified atypical AN cases based on the Society for Adolescent Health and Medicine clinical guidelines for classifying

malnutrition in the context of eating disorders.¹⁰ Data for this study were extracted from clinical files as part of a clinical research audit approved by the Royal Children’s Hospital Human Research Ethics Committee. The ethics committee approved a waiver of informed consent in this study.

Measures

Lying and standing pulse rate and blood pressure, temperature, height, and weight were measured at presentation by a nurse, pediatrician, or trained research assistant. Bradycardia was defined as lying pulse rate < 50 beats per minute, hypotension as lying systolic blood pressure < 90 mm Hg, and hypothermia as body temperature $< 35.5^\circ\text{C}$. Orthostatic instability was defined as a difference in lying and standing observations of > 20 beats per minute for pulse rate or > 10 mm Hg for blood pressure.⁵ Illness history, including duration of illness, premorbid weight, amenorrhea, current and past medical conditions, current and past emotional and developmental disorders, and current medications, were obtained from clinical assessments with patients and parents. Overweight and obesity were defined respectively as BMI ≥ 85 th percentile and BMI ≥ 95 th percentile for age and gender. Amenorrhea was defined as the absence of menarche in girls aged 15 years or older (primary) or the absence of menstruation for the past 3 months (secondary). Eating disorder symptom severity and frequency of behaviors (ie, binge eating, vomiting, laxative use, exercise) were measured by using the EDE.⁶ Psychiatric comorbidity and suicidal ideation and self-harm were assessed by using the parent and child versions of the Mini International Neuropsychiatric Interview¹¹ and psychiatrist evaluation. General obsessive-compulsive tendencies were assessed by patient interview by using the

TABLE 1 Distribution of Eating Disorder Diagnoses After Assessment (*n* = 256), 2010–2014

Diagnosis	<i>n</i>	%
AN	118	46.1
Bulimia nervosa	2	0.8
Binge-eating disorder	0	0.0
AN, partial remission	9	3.5
Other specified feeding or eating disorder		
Atypical AN	42	16.4
AN: limited body image/behaviors	40	15.6
Bulimia nervosa: low frequency/duration	2	0.8
Binge-eating disorder: low frequency/duration	0	0.0
Purging disorder	4	1.6
Unspecified feeding or eating disorder	28	10.9
No eating disorder	11	4.3

Children's Yale-Brown Obsessive Compulsive Scale (CY-BOCS),¹² and eating disorder-specific obsessive-compulsive tendencies were assessed by using the Yale-Brown-Cornell Eating Disorder Scale (YBC-EDS).¹³ Patients completed written versions of the Children's Depression Inventory¹⁴ and Rosenberg Self-Esteem Scale.¹⁵

Statistical Analysis

The proportion of adolescents presenting to the clinic with each diagnosis was calculated and the number with atypical AN and AN identified. Physical, psychological, and behavioral features were calculated as means and SDs for continuous variables and proportions for categorical variables. Confidence intervals of means and proportions were also calculated. Adolescents with atypical AN were compared with those with full-threshold AN by using independent *t*-tests for continuous variables (with mean difference and 95% confidence intervals) and χ^2 for categorical variables (with odds ratios and 95% confidence intervals).

RESULTS

During the study period, 256 patients were assessed (73% outpatients; 27% inpatients). The distribution of diagnoses is shown in Table 1. Forty-two (16%) had atypical AN and 118 (46%) had full-threshold AN. Atypical AN represented 26% of patients with atypical AN or full-threshold AN.

The physical characteristics of patients with atypical AN and patients with full-threshold AN are shown in Table 2. Those with atypical AN were mostly girls aged between 14 and 16 years. Although most had been preponderantly overweight or obese, far fewer were overweight or obese at presentation. Mean weight loss was 17.6 kg over 13.3 months. At presentation, 24% of adolescents with atypical AN had bradycardia, 43% had marked orthostatic changes in pulse rate or blood pressure, and >40% were acutely hospitalized. Approximately one-third of girls with atypical AN aged >15 years and not on oral contraceptives had secondary amenorrhea; an additional 3 cases had missed 1 or 2 periods in the 3 months before presentation. There were no cases of primary amenorrhea.

Compared with full-threshold AN, we found statistical evidence that adolescents with atypical AN were more likely to have been preponderantly overweight or obese ($P < .001$), and to have lost more weight ($P < .001$) over a longer period ($P = .04$). We found no evidence that those with atypical AN differed from those with AN in resting pulse rate ($P = .87$), or frequency of bradycardia ($P = .28$), marked orthostatic changes ($P = .60$), hypothermia ($P = .68$), or admission to hospital at presentation ($P = .21$). Systolic blood pressure ($P < .001$) and temperature ($P = .04$) were higher in adolescents with atypical AN, and amenorrhea was less

frequent ($P = .003$). There was some evidence that menarche was slightly earlier and hypotension less frequent in those with atypical AN ($P = .05$).

The psychological and behavioral features of adolescents with atypical AN and AN are shown in Table 3. Those with atypical AN reported significantly more severe eating disorder symptoms on all subscales of the EDE (Restraint $P = .03$; Eating Concerns $P = .009$; Shape Concerns, Weight Concerns, and Global Score were all significant at $P < .001$). We found no evidence that binge eating ($P = .77$), vomiting ($P = .83$), laxative misuse ($P = .47$), or compulsive exercise ($P = .10$) differed significantly between the groups.

There was no evidence of significant differences between the 2 disorders in rates of psychiatric comorbidity ($P = .44$), use of psychotropic medication ($P = .68$), self-harm or suicidal ideation ($P = .72$), severity of depressive symptomatology ($P = .10$), or obsessive compulsiveness (CY-BOCS, $P = .18$; YBCEDS, $P = .24$). There was some evidence that self-esteem was somewhat poorer ($P = .08$) in those with atypical AN. The most common psychiatric comorbidities were depressive disorders (31% atypical AN; 31% AN), anxiety disorders (17% atypical AN; 24% AN), and obsessive-compulsive disorder (5% atypical AN; 6% AN).

DISCUSSION

This study demonstrates that atypical AN in adolescents is a major psychiatric illness with important physical and psychological complications. Of note, despite not being underweight at presentation, nearly 1 in 4 adolescents with atypical AN had bradycardia, 1 in 3 had amenorrhea, and >40% required admission to hospital. Psychological morbidity was also marked, with distress related to eating and body image being more severe than that

TABLE 2 Physical Characteristics of Adolescents With Atypical AN and Full-Threshold AN

	Atypical AN		AN		OR or Mean Difference	(95% CI)	P
	M (SD) or n (%)	(95% CI)	M (SD) or n (%)	(95% CI)			
Age, y	15.49 (1.43)	(15.07 to 15.92)	15.40 (1.67)	(15.09 to 15.70)	0.93	(-0.48 to 0.67)	.75
Female gender	37 (88%)	(78.6 to 97.6)	104 (88%)	(82.2 to 94.0)	1.00	(0.34 to 2.96)	.99
Weight at presentation							
Kilograms	58.91 (11.83)	(55.51 to 62.53)	42.98 (6.94)	(41.70 to 44.19)	15.94	(12.92 to 18.95)	<.001
BMI	21.37 (3.04)	(20.41 to 22.28)	16.00 (1.53)	(15.73 to 16.29)	5.36	(4.64 to 6.08)	<.001
BMI z-score	0.24 (0.69)	(0.03 to 0.45)	-2.12 (1.22)	(-2.35 to -1.91)	2.37	(1.98 to 2.76)	<.001
% <i>m</i> BMI	105.96 (13.83)	(102.29 to 110.17)	79.85 (7.05)	(78.65 to 81.10)	26.12	(22.82 to 29.42)	<.001
Overweight or obese	7 (17%)	(7.1 to 28.6)	0 (0%)	(NA)	1.20	(1.05 to 1.37)	<.001
Highest premenoid weight							
Kilograms	76.50 (19.59)	(70.72 to 82.94)	53.92 (10.85)	(52.01 to 56.07)	22.58	(17.72 to 27.44)	<.001
BMI	27.66 (5.48)	(26.08 to 29.49)	20.11 (3.18)	(19.56 to 20.70)	7.56	(6.17 to 8.95)	<.001
BMI z-score	1.52 (0.62)	(1.34 to 1.71)	-0.06 (0.99)	(-0.23 to 0.13)	1.58	(1.26 to 1.90)	<.001
% <i>m</i> BMI	141.78 (27.29)	(133.99 to 151.20)	102.83 (16.31)	(99.95 to 106.16)	38.95	(31.92 to 45.98)	<.001
Overweight or obese ^a	30 (71%)	(57.1 to 83.3)	14 (12%)	(6.8 to 18.8)	18.39	(7.69 to 43.98)	<.001
Loss of weight							
Kilograms	17.59 (9.73)	(14.85 to 20.68)	10.98 (7.77)	(9.62 to 12.33)	6.61	(3.65 to 9.56)	<.001
Months	13.32 (8.45)	(10.83 to 15.86)	10.24 (8.30)	(8.76 to 11.82)	3.08	(0.11 to 6.04)	.04
Vital signs							
Pulse rate	59.8 (11.0)	(56.4 to 63.0)	59.3 (15.0)	(56.5 to 62.3)	0.42	(-4.58 to 5.41)	.87
Systolic blood pressure	106.2 (10.3)	(103.1 to 109.1)	99.1 (11.3)	(96.9 to 101.1)	7.14	(3.21 to 11.06)	<.001
Diastolic blood pressure	59.6 (8.4)	(57.1 to 62.1)	57.0 (10.1)	(55.2 to 58.8)	2.60	(-0.84 to 6.05)	.11
Temperature	36.8 (0.7)	(36.5 to 37.0)	36.4 (0.7)	(36.3 to 36.6)	0.31	(0.02 to 0.62)	.04
Medical instability							
Bradycardia, <50 beats per minute	10 (24%)	(11.9 to 38.1)	38 (33%)	(24.1 to 41.4)	0.64	(0.27 to 1.44)	.28
Hypotension, systolic pressure <90 mm Hg	4 (10%)	(2.4 to 19.0)	27 (23%)	(15.5 to 31.0)	0.35	(0.11 to 1.06)	.05
Orthostatic instability, >20 beats per minute, >10 mm Hg	18 (43%)	(28.6 to 57.1)	44 (38%)	(29.6 to 47.0)	1.21	(0.59 to 2.48)	.60
Hypothermia, <35.5°C	3 (10%)	(0.0 to 22.6)	11 (13%)	(5.7 to 19.3)	0.75	(0.20 to 2.89)	.68
Admitted to hospital at presentation	17 (41%)	(28.6 to 57.1)	61 (52%)	(42.4 to 61.0)	0.70	(0.35 to 1.43)	.21
Age at menarche	11.92 (1.11)	(11.59 to 12.26)	12.41 (1.35)	(12.12 to 12.68)	-0.49	(-0.99 to 0.01)	.05
Amenorrhea ^b	12 (32%)	(18.9 to 48.6)	51 (61%)	(51.2 to 72.0)	0.29	(0.13 to 0.66)	.003

CI, confidence interval; OR, odds ratio; %*m*BMI, percent of median BMI for age and gender.

^a BMI \geq 85th percentile.

^b Excludes girls on oral contraception or premenarchal, and boys.

TABLE 3 Psychological and Behavioral Features of Adolescents With Atypical AN and Full-Threshold AN

	Atypical AN		AN		OR or Mean Difference	(95% CI)	P
	M (SD) or n (%)	(95% CI)	M (SD) or n (%)	(95% CI)			
EDE							
Restraint	3.48 (1.74)	(2.99 to 4.01)	2.72 (2.10)	(2.34 to 3.09)	0.76	(0.09 to 1.42)	.02
Eating concerns	2.55 (1.59)	(2.08 to 3.03)	1.78 (1.58)	(1.51 to 2.07)	0.76	(0.20 to 1.33)	.009
Shape concerns	3.91 (1.88)	(3.35 to 4.51)	2.50 (1.94)	(2.14 to 2.88)	1.4	(0.71 to 2.10)	<.001
Weight concerns	3.55 (1.75)	(3.00 to 4.07)	2.16 (1.69)	(1.85 to 2.47)	1.39	(0.78 to 2.00)	<.001
Global score	3.37 (1.51)	(2.88 to 3.82)	2.29 (1.64)	(1.97 to 2.59)	1.08	(0.51 to 1.66)	<.001
Objective binge eating	3 (7%)	(0.0 to 12.2)	7 (6%)	(0.9 to 6.9)	1.23	(0.30 to 5.00)	.77
Self-induced vomiting	9 (22%)	(7.3 to 29.3)	24 (21%)	(8.5 to 21.4)	1.09	(0.46 to 2.59)	.83
Laxative misuse	2 (5%)	(0.0 to 12.2)	3 (3%)	(0.0 to 4.3)	1.95	(0.31 to 12.10)	.47
Compulsive exercise	30 (73%)	(56.1 to 85.3)	68 (59%)	(44.8 to 63.8)	1.93	(0.88 to 4.21)	.10
Psychiatric comorbidity	16 (38%)	(23.8 to 52.4)	53 (45%)	(36.4 to 53.4)	0.76	(0.37 to 1.55)	.44
Psychotropic medication	4 (9%)	(2.4 to 19.0)	14 (12%)	(5.9 to 17.8)	0.78	(0.24 to 2.52)	.68
Self-harm/Suicidal ideation	17 (43%)	(27.5 to 57.5)	46 (39%)	(30.8 to 47.9)	1.14	(0.55 to 2.36)	.72
Depressive symptoms (CDI)	22.76 (12.17)	(19.03 to 26.94)	18.98 (11.92)	(16.68 to 21.09)	3.78	(−0.78 to 8.34)	.10
Self-Esteem (RSE)	22.24 (7.69)	(19.78 to 24.64)	24.81 (7.36)	(23.40 to 26.40)	−2.57	(−5.40 to 0.26)	.08
Obsessive compulsiveness (CY-BOCS)	6.14 (8.06)	(3.69 to 8.69)	4.12 (7.35)	(2.81 to 5.61)	2.03	(−0.88 to 4.94)	.18
Eating/weight-related obsessive compulsiveness (YBC-EDS)	15.74 (9.10)	(12.57 to 18.80)	13.63 (9.07)	(11.84 to 15.49)	2.11	(−1.40 to 5.62)	.24

CDI, Children's Depression Inventory; CI, confidence interval; CY-BOCS, Child Yale-Brown Obsessive Compulsive Scale; OR, odds ratio; RSE, Rosenberg Self-Esteem Scale.

reported by adolescents with AN. Overall, we found little evidence that the physical and psychological morbidity of adolescents with atypical AN was any less severe than that of full-threshold AN. We have previously reported on the dramatic increase in the proportion of adolescent inpatients with restrictive eating disorders who are not underweight.³ In this clinic, atypical AN now constitutes a considerable proportion of adolescents with restrictive AN across inpatient and outpatient services, with 1 case of atypical AN diagnosed for every 3 cases of full-threshold AN and no evidence of a difference in the proportion requiring admission to hospital at presentation.

It is well established that having AN has a considerable impact on physical health.¹⁶ However, the extent of physical compromise reported here in adolescents with atypical AN, who are by definition not underweight, suggests that beyond the effects of underweight, substantial loss of weight and/or rapid weight loss may of itself be detrimental to physical

health. These data build on earlier studies from the United States,² United Kingdom,¹⁷ and Canada¹⁸ that reported considerable physical instability in the context of the *Diagnostic and Statistical Manual Mental Disorders, Fourth Edition* diagnosis of Eating Disorder Not Otherwise Specified, a less specific diagnosis than atypical AN. This study reinforces the importance of physical assessment in the context of weight loss, regardless of the patient's actual weight status. We recommend that assessment include pulse rate and blood pressure (lying and orthostatic changes), as well as temperature. In addition, weight status should be considered in relation to individual trajectories by reviewing growth charts to determine if there has been a marked deviation, regardless of BMI. This is particularly important given known limitations of BMI norms.¹⁰

In addition to signs of physical deterioration, adolescents with atypical AN experienced high rates of psychological morbidity. Indeed,

38% had a psychiatric comorbidity, and 43% experienced self-harm or suicidal ideation. Notably, compared with adolescents with full-threshold AN, those with atypical AN had significantly higher levels of distress related to eating and body image. This finding is arguably expected, given that higher BMI is known to be associated with greater body dissatisfaction.¹⁹ However, most adolescents with atypical AN were within the healthy weight range when assessed, yet their EDE scores were substantially higher than norms.^{20,21} The intense distress experienced by adolescents with atypical AN may stem from a dissonance between their current weight and ideal weight (ie, wanting to be considerably thinner than they are) and a fear of fatness that their weight history might exacerbate. The findings indicate that, in addition to assessing physical stability, clinicians should screen for cognitive and behavioral eating disorder symptoms when patients of any weight are known to have lost weight, regardless of what type of service they present to (eg, primary care, obesity service,

eating disorder service). Although specific eating disorder cognitions can be difficult to assess, the behaviors associated with these, such as restriction of food intake, excessive exercise, and purging, are not difficult for caregivers to detect, and most families readily acknowledged increasing social withdrawal, depression, and anxiety in these patients. It is therefore recommended that screening for eating disorder symptoms and associated morbidity involve both the adolescents and their caregivers.

Of significance is that 71% of these adolescents with atypical AN were premorbidly overweight or obese compared with just 12% of those with AN. That many adolescents with atypical AN are heavier when the disorder develops suggests that, with a similar duration of symptoms, they may present to clinical services before they become underweight. Of interest, a recent US study found that adolescents with restrictive eating disorders who were premorbidly overweight or obese presented at a higher body mass compared with those with no overweight history, and had a longer interval between symptom onset and identification.²² Delayed diagnosis of restrictive eating disorders has been described when either carers or health care professionals discount the possibility of an eating disorder due to the observed body size. A recent case report described 2 patients who had been overweight at the onset of a restrictive eating disorder.²³ Despite multiple health service encounters and continued weight loss over several years, they were not diagnosed and treated until they became underweight. Arguably, these are “missed” cases of atypical AN. Likewise the 12% of patients with AN in the current study who were premorbidly overweight or obese could potentially have been diagnosed earlier. This highlights the risk of progression to full-threshold

AN and the importance of timely diagnosis. It also suggests that the prevalence of atypical AN in the community may be relatively high given that these adolescents are less likely to come to clinical attention than their underweight counterparts.

The increasing prevalence of overweight and obesity in the community^{24,25} is likely to contribute to the high rate of premorbid overweight in atypical AN and the observed increase in atypical AN presentations.³ Overweight and obese adolescents are the target of stigma, weight-teasing, and other antiobesity messages, which can lead to high levels of body dissatisfaction and engagement in unhealthy weight loss behaviors, such as fasting, excessive exercise, and purging.^{26–28} In this context, overweight and obesity might trigger the development of a restrictive eating disorder. Genetic predisposition to disordered eating would heighten this risk, although AN-like symptoms have been observed in otherwise healthy individuals subjected to starvation.²⁹

Although changes to the DSM-5 criteria for AN were intended to increase clinical utility, with less reliance on weight and greater focus on behaviors and abnormal cognitions,³⁰ the assessment of “significantly low weight” (p. 338)¹ and “significant loss of weight” (p. 353)¹ continue to pose challenges when operationalized in both research studies and clinical practice. For example, a recent study found that, in the absence of specified cutoffs, variation in how DSM-5 criteria were applied across 14 eating disorder services resulted in a diagnostic overlap between AN and atypical AN such that 14% of patients diagnosed with AN were $\geq 90\%$ mBMI and 27% of patients diagnosed with atypical AN were $< 90\%$ mBMI.³¹ For this study, we applied arbitrary cutoffs in line with the Society of Adolescent Health and

Medicine¹⁰ (ie, $\leq 89\%$ mBMI for low weight and $\geq 10\%$ body weight for significant weight loss). Low weight is clearly an important marker of physical severity of AN. However, this study suggests that in the context of abnormal cognitions, loss of weight, rather than underweight, may be the key feature of restrictive eating disorders.

A limitation of this study is that premorbid weight was most often reported retrospectively by patients and parents, as few adolescents had recent growth records available. Inaccurate recall could have affected both the frequency of premorbid overweight and obesity reported, and the degree of weight loss. Were there systematic bias in the reporting of premorbid weight, however, it would most likely be in the direction of underestimation due to shame associated with reporting high premorbid weight. If so, this may be more common in the atypical AN group, thus minimizing the differences between the 2 groups on these indices, rather than the reverse. Height at highest premorbid weight was not available, and thus height at presentation was used to calculate BMI. This may have led to underestimation of highest premorbid BMI; however, given the age of mean peak height velocity, the overall effect on the results is expected to be small and would have affected both groups equally. A further limitation of this study was the relatively small sample size, which may have affected our ability to detect differences in characteristics between the 2 groups.

The results of this study highlight the clinical significance of atypical AN, and also raise several questions. For example, does atypical AN share the same genotype as AN, but is phenotypically different due to a higher weight at illness onset? An alternative hypothesis is that significant or rapid weight loss by using unhealthy methods, such as

fasting or purging, results in physical and psychological sequelae that resemble AN²⁹ in the absence of an AN genotype, and that individuals are more likely to engage in these weight loss behaviors if they are overweight. There is evidence for genetic heritability³² and large genome-wide studies are under way in patients with AN.³³ In the meantime, studies of endophenotypes may shed light on this question; for example, examining whether neurologic features known to be characteristic of patients with AN are also found in patients with atypical AN. A more immediate question arises with regard to how to treat individuals with atypical AN. To date, our service has offered family-based treatment^{4,34} to patients with AN and atypical AN but the extent

of parents' engagement with family-based treatment and the response to treatment in those with atypical AN has not been systematically reported.

The well-known health and social impacts of obesity underscore why health professionals, parents, and adolescents are typically pleased when adolescents who are obese or overweight lose weight. This study is a cogent reminder of the importance of careful physical, behavioral, and psychological assessment in adolescents who have lost weight, even in those at or above what would appear to be a healthy weight, to detect and intervene with those for whom even small amounts of weight loss may signal an underlying eating disorder.

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ABBREVIATIONS

AN:	anorexia nervosa
CY-BOCS:	Children's Yale-Brown Obsessive Compulsive Scale
DSM-5:	<i>Diagnostic and Statistical Manual of Mental Disorders, 5th Edition</i>
EDE:	Eating Disorder Examination
mBMI:	median BMI
YBC-EDS:	Yale-Brown-Cornell Eating Disorders Scale

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