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Eating Patterns in Youth with Restricting and Binge Eating/Purging Type Anorexia Nervosa

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Abstract

Objective—To describe eating patterns in youth with restricting and binge/purge type anorexia nervosa (AN) and to examine whether eating patterns are associated with binge eating or purging behaviors.

Method—Participants included 160 children and adolescents ($M=15.14\pm2.17$ years) evaluated at The University of Chicago Eating Disorders Program who met criteria for DSM-5 restrictive type AN (AN-R; 75%; $n=120$) or binge eating/purging type AN (AN-BE/P; 25%; $n=40$). All participants completed the Eating Disorder Examination (EDE) upon initial evaluation.

Results—Youth with AN-R and AN-BE/P differed in their eating patterns, such that youth with AN-R consumed meals and snacks more regularly relative to youth with AN-BE/P. Among youth with AN-BE/P, skipping dinner was associated with a greater number of binge eating episodes ($r=-.379$, $p<0.05$), while skipping breakfast was associated with a greater number of purging episodes ($r=-.309$, $p<0.05$).

Discussion—Youth with AN-R generally follow a regular meal schedule, but are likely consuming insufficient amounts of food across meals and snacks. In contrast, youth with AN-BE/P tend to have more irregular eating patterns, which may play a role in binge eating and purging behaviors. Adults monitoring of meals may be beneficial for youth with AN, and particularly those with AN-BE/P who engage in irregular eating patterns.

Keywords

eating pattern; meal frequency; anorexia nervosa; binge eating and purging; youth

Anorexia nervosa (AN) is a life-threatening illness characterized by greatly restricted energy intake, fear of weight gain, and body image disturbance.¹ The current Diagnostic and Statistical Manual of Mental Disorders (DSM-5¹) specifies two sub groups of individuals with AN- those who engage in binge eating and purging (i.e., binge eating/purge type; AN-BE/P) and those who do not (i.e., restricting type; AN-R). Previous research has found that patients with AN-BE/P often have higher eating disorder severity, more co-morbidities and worse prognosis than patients with AN-R.² However, other research has shown minimal

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differences between the two groups.³ Despite the growing literature looking at AN-R and AN-BE/P, factors related to the development of binge eating and purging in AN remain unclear. Binge eating and purging have been explained via the restraint model,⁴ which theorizes that dietary restraint leads to binge eating and subsequent purging; this in turn leads to a cycle of increased efforts of restraint. Although this model was originally created to explain binge eating and purging in Bulimia Nervosa (BN) and Binge Eating Disorder (BED),⁴ irregular eating patterns may contribute to the development and maintenance of binge eating and purging across eating disorder diagnoses, including AN-BE/P.

Previous research suggests that women with AN either follow a regular meal and snack pattern (i.e., three meals and three snacks per day) or have irregular eating patterns (i.e. skipping meals/long intervals without eating).⁵ Other research using computer-based 24-hour dietary recall⁶ reveals that adults with AN have approximately six eating episodes per day, with fewer eating episodes on purge-only days, and more eating episodes on binge days (with or without purging). Although a few studies have suggested that eating patterns in adults with AN typically involve fixed meal times and stereotyped food choices,⁷ other studies suggest that this rigid dietary pattern is only one of several eating patterns among those with AN.⁵ These studies contribute to current knowledge about dietary intake patterns among adults with AN, but there is a gap in understanding whether these patterns generalize to adolescents with AN. Furthermore, little is known about the timing of dietary intake patterns, and which specific meals and/or snacks are most often consumed over the course of the day.

Research examining specific meal and snack consumption has focused primarily on individuals with BN and BED.^{8–9} These studies suggest that individuals who consume meals and snacks with irregular frequency also tend to engage in binge eating. Loss of control (i.e., the sense that one cannot control what or how much one is eating) also seems to play a role in frequency of eating, such that youth with loss of control eating consume fewer meals but more snacks than their peers without loss of control.¹⁰ In spite of the growing literature exploring eating patterns and binge or purge behaviors, there has been a lack of research using AN samples. It is unknown whether these relations between eating patterns, loss of control, binge eating, and purging hold true in AN, and to what extent they differ by AN subtype. Understanding the link between irregular eating patterns and binge eating or purging across eating disorders may elucidate a common mechanism that could inform future treatment development. In particular, a better understanding of meal patterns in AN is needed to individually tailor interventions. For example, the focus of one intervention may be to augment portions for patients with AN who are already participating in regular meals, while implementing a regular meal schedule may be more important for patients who are not eating regular meals.

The current study expands upon the existing literature by describing eating patterns in youth with AN-R and AN-BE/P, with a specific focus on meal and snack consumption. This study seeks to address two aims: (1) How frequently are meals and snacks consumed by youth with AN-R and AN-BE/P? (2) Is meal and snack consumption frequency associated with binge eating or purging behaviors? It was hypothesized that youth with AN-R would report more regular eating patterns relative to youth with AN-BE/P, and that youth with AN-BE/P

who have less regular eating patterns would present with more frequent binge eating and purging episodes. Findings from this study may contribute to our understanding of eating patterns in maintaining binge eating and purging in AN.

Method

Data were collected from 160 youth ages 8 to 18 who presented to The University of Chicago's Eating Disorders Program between 2006 and 2012 and met DSM-5¹ criteria for AN. Participants completed a structured interview and paper-and-pencil questionnaires during a 3-hr baseline assessment prior to the start of treatment. Written informed consent for patients 18 years of age, or parental/guardian consent and adolescent assent for patients under 18 years of age were obtained. Our current estimates are that 85% of clinic cases consented to participate in the study. The University of Chicago's Institutional Review Board approved this study.

Measures

The Eating Disorder Examination—The Eating Disorder Examination (EDE) is a semi-structured investigator-based interview measuring cognitive and behavioral symptoms related to eating disorders.¹¹ Frequency of self-induced vomiting, laxative misuse, diuretic misuse, driven exercise, fasting, subjective and objective binge eating are assessed, as well as meal frequency (breakfast, lunch, and evening meal) and snack frequency (midmorning, afternoon and evening) during the 28 days immediately prior to assessment. According to the EDE, the frequency of meals and snacks are coded with the following scale: “0” indicates that the meal/snack was consumed on none of the past 28 days, “1” indicates between 1 and 5 days, “2” represents that the meal/snack was consumed between 6 and 12 days, “3” indicates between 13 and 15 days, “4” represents between 16 and 22 days, “5” indicates between 23 and 27 days, and “6” indicates that the meal or snack was consumed on all 28 days. The EDE has demonstrated good reliability and validity and has been utilized in multiple studies of youth with eating disorders.^{12–13} The EDE was used to generate DSM-5 diagnoses for an eating disorder.

Physical Assessment—A trained research assistant measured the weight and height of each participant using a calibrated digital or balance-beam scale. All patients were weighed without shoes and in light, indoor clothing.

Data Analysis

Data were analyzed using SPSS Version 19. One-way ANOVA was used to compare AN-R and AN-BE/P on age, age of onset, duration of illness, percent expected body weight (%EBW), and body mass index (BMI), in order to determine which factors to use as covariates. One-way ANCOVA was used to compare groups on eating patterns. Age and BMI were included as covariates in the one-way ANCOVA test to adjust for the difference in age and BMI between groups and for the effect of age and BMI across groups on eating patterns. It may be that younger kids are monitored more closely by their parents or participate more frequently in family meals.²⁵ Furthermore, it is also possible that BMI plays a role in eating patterns.¹⁰ Pearson's correlations were used to examine relations

between eating patterns and frequency of binge eating and purging episodes among the AN-BE/P group. These analyses were conducted only with the AN-BE/P group since the prevalence of binge eating and purging was low among the AN-R group. A *post hoc* power analysis was performed based on the reported results of one primary outcome measure (i.e., dinner consumption). This analysis indicated that our group sizes of 40 and 120 subjects obtained 85.7% power to detect differences in dinner consumption frequency when employing the traditional statistical significance criterion of 5%.²⁶

The meal and snack frequency are coded in the EDE using a 7-point Likert scale. Since these codes are ordinal, but are based on an underlying continuous variable (number of days), we followed Matheson et al.'s practice¹⁰ that involves transforming the codes into numeric values that represent midpoints.¹⁴ As a result, the data presented are more representative of the actual number of days that meals and snacks were reported to be consumed. Therefore, "1" was recoded as 3 days in the past month, "2" recoded as 9 days, "3" recoded as 14 days, "4" as 19 days, "5" as 25 days, and "6" recoded as 28.

Results

Sample Characteristics

Participating youth were mostly Caucasian (91.3%; n=146) females (93.8%; n=150) with a mean age of 15.14 (± 2.17) years. Youth had a mean body mass index (BMI; kg/m²) of 15.95 (± 1.25) and mean percent of expected body weight (%EBW) of 80.13 (± 6.25), based on 50th centile BMI for age and gender using Centers for Disease Control and Prevention growth charts.¹⁵ More participants were characterized by the restrictive type (75%; n=120) rather than the binge eating/purging type (25%; n=40). As expected, the subtypes group differed in binge eating/purging episodes (15.45 v. 0.03 episodes in the last month) and BMI (16.44 v. 15.79 kg/m²) but not in %EBW. In addition, the AN-BE/P group was significantly older (16.27 v. 14.84 years) and reported older age of onset (15.15 v. 13.62 years). Table 1 shows the characteristics of the participants.

Meal and Snack Patterns among Restricting and Binge Eating/Purging AN Subtypes

Participants with restricting and binge eating/purging types differed in their meal patterns (see Table 2). Adjusting for age and BMI, youth with the BE/P type reported consuming breakfast ($F=9.25$, $p<0.01$, Partial $\eta^2=.056$), lunch ($F=18.64$, $p<0.001$, Partial $\eta^2=.107$) and dinner ($F=12.12$, $p<0.01$, Partial $\eta^2=.072$) significantly less often than youth with restricting type. There were also differences in snacking patterns. Adjusting for age as a covariate, youth with binge/purge type reported consuming mid-morning snack ($F=5.29$, $p<0.05$, Partial $\eta^2=.035$) and mid-afternoon sack ($F=5.66$, $p<0.01$, Partial $\eta^2=.035$) significantly less often than youth with restricting type. There were no group differences in evening snack consumption.

Dietary Patterns and Eating Disorder Behaviors

Correlations between eating episodes and eating disorder behaviors (binge eating and purging) among participants with AN-BE/P are shown in Table 3. Correlations between meal and snack consumption and binge eating show that only dinner was significantly

correlated with binge eating, such that patients with the BE/P type who consumed dinner more often had fewer binge eating episodes ($r = -.379, p < .05$). Correlations between meal and snack consumption and purging episodes show that only breakfast was significantly correlated to purging episodes, such that patients with AN-BE/P who consumed breakfast more often had fewer purging episodes ($r = -.309, p < .05$).

Discussion

The aim of the present study was to examine dietary patterns among children and adolescents with AN, and to identify differences in these patterns between AN-R and AN-BE/P. The results show that youth with AN-R and AN-BE/P differ in meal and snack consumption frequency; such that youth with AN-R have more regular eating patterns relative to youth with AN-BE/P. Although our data is cross-sectional and cannot suggest causation, this study provides preliminary evidence that irregular meal patterns may be associated with binge eating and purging behaviors among youth with AN, and builds on the existing literature with BN, BED, and loss of control eating samples.^{8–10}

Our data show that youth with AN-R mainly follow regular eating patterns and reportedly consume an average of 2.7 meals and 1.3 snacks per day. These data are consistent with previous studies looking at eating patterns among adults with AN-R,⁶ with relatively high numbers of eating episodes per day. It may be that some youth with AN-R follow a regular meal schedule, but it is likely that given their low body weight they are taking in inadequate calories during each eating episode (either by nature of insufficient quantities, or low caloric density food choices). Additionally, the meal pattern observed for AN-BE/P type is reminiscent of that observed in overweight youth with loss of control eating.¹⁰ This could suggest that less regular eating patterns are associated with loss of control eating across diagnoses.

Previous studies have shown that breakfast is the least frequently consumed meal among healthy adolescents without an eating disorder.^{16–18} Interestingly, this was not true in our sample. Rather, lunch was the least frequently consumed meal in our sample of youth with AN, with participants with AN-BE/P reporting eating lunch less than two thirds of the time. Lunch, which is generally eaten at school without adult supervision, may be perceived by youth with AN as an opportune meal to skip in an effort to reduce their caloric intake. In contrast, breakfast and dinner are often eaten at home and therefore more likely to be monitored by family members. This finding may guide prevention and intervention efforts; for example, school staff may be able to identify students potentially at-risk for AN in prevention efforts, while parents and/or school staff might help to monitor lunch for youth with diagnosed AN.

Our findings suggest that irregular eating patterns are associated with binge eating and purging among youth with AN, and that these patterns were more common in youth with AN-BE/P type. Additionally, youth with AN-BE/P who skipped dinner more often were likely to have more binge eating episodes, while youth with AN-BE/P who skipped breakfast more often were likely to have more purging episodes. These findings parallel previous studies with BED samples, showing that binge eating is positively correlated with

skipping dinner.⁸⁻⁹ It may be that the mechanism⁴ associated with the development and maintenance of binge eating and purging is similar across eating disorder diagnoses. This mechanism suggests that dietary restraint leads to binge eating, which may lead to purging, and this in turn leads to a vicious cycle of increased efforts to restrict eating again. However, it may be that among youth with AN, it is episodic dietary restraint (i.e., skipping meals and snacks) rather than consistent dietary restraint (i.e., eating regularly but consistently consuming insufficient quantities at meals and snacks), that increases risk for binge eating and purging behaviors. Alternatively, factors unrelated to restraint (e.g., negative affect) may lead to binge eating, which in turn lead to dietary restriction (e.g., skipping meals) to compensate for binge eating. Our data do not inform the temporal order of these phenomena,¹⁹⁻²⁰ but they do highlight an important association between skipping meals and binge eating and purging behavior.

To our knowledge, this is the first study to investigate meal and snack frequencies in youth with AN. Our sample consisted of children and adolescents with AN-R and AN-BE/P whose characteristics paralleled previous studies showing that AN subtypes differ in age of onset and BMI.³ Another strength of the current study is the use of well-validated semi-structured interviews to collect data.¹¹ The semi-structured interviews were conducted by interviewers who had received extensive training on how to assess meal and snack patterns, binge/purge behaviors, and eating disorder psychopathology.

Several limitations should be noted. First, the use of cross-sectional data for this particular study (as opposed to recent Ecological Momentary Assessment research⁶) did not inform the temporal order of meal consumption and binge/purge behaviors or eating disorder psychopathology. Second, the study population consisted of a relatively small sample of children and adolescents who presented for eating disorder treatment, which limits generalization to non-treatment seeking samples. Third, our study population included only youth with AN, which limits our understanding of how youth with AN compare to the general population or to youth with other eating disorders. Fourth, previous research has shown that longer duration of illness is associated with AN-BE/P, and that many patients with AN-R will later meet diagnostic criteria for AN-BE/P if followed for longer periods of time.³ The current sample consisted of children and adolescents with relatively short duration of illness, which limits our understanding of the differential impact of duration of illness on eating patterns among AN. Fifth, meal and snack consumption was assessed by self-report, albeit via a trained interviewer, which does not illuminate the possibility of youth minimizing their symptoms by over-reporting consumption, or vice-versa. Nevertheless, previous studies have found that self-report food intake data are generally quite accurate among underweight patients with AN.²⁰⁻²³ Finally, a *post-hoc* power analysis was less than optimal. However, as we did not construct our study with a power analysis at the start, we were unable to report an *a-priori* power analysis.

These findings may inform future treatment development. First, it was found that youth with AN generally have fairly regular eating patterns, but less so in youth with binge/purge type AN. These youth were most likely to skip lunch, and therefore might benefit from supervision during this time. Furthermore, for those with AN-BE/P type, skipping breakfast and dinner was associated with purging and binge eating, respectively. Therefore, adult

monitoring during all three meals may be particularly beneficial for youth with AN-BE/P. Additionally, treatment may focus on improving regular eating for those with more irregular eating habits, but generally youth with AN may need to increase the volume or caloric density of their dietary intake rather than its frequency. Lastly, this study suggests that the restraint theory which theorizes that dietary restraint leads to binge eating behaviors⁴ does not fully apply to youth with AN. It may be that among youth with AN, it is episodic restraint rather than consistent restraint that leads to binge eating and purging. Thus specific treatments (e.g., family-based treatment²⁷) would need to be tailored to youth with AN, as methods of preventing binge eating and purging among patients with BN or BED (e.g., in cognitive behavioral treatments⁴) may not transfer well to those with AN.

In order to better understand the role of eating patterns in the development and maintenance of binge eating and purging among youth with AN, future work should look at additional variables such as the quantity and types of food consumed at each meal. In addition, future research should focus on longitudinal designs in order to better understand the temporal order of eating patterns and binge eating and purging, as well as how these patterns may change with both time and treatment.

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TABLE 1

Patient Characteristics by AN Subtype, M (SD)

	Restricting AN (<i>n</i> =120)	Binge Purge AN (<i>n</i> =40)	Test Statistic
Age (years)	14.77 (2.1)	16.26 (1.9)	$F(1,159)=15.41^{**}$
Age of Onset (years)	13.62 (2.0)	15.15 (1.7)	$F(1,159)=17.96^{**}$
Duration of Illness (months)	13.85 (15.1)	10.28 (6.2)	$F(1,159)=1.34$
% Expected Body Weight	80.03 (6.6)	80.43 (5.3)	$F(1,159)=.126$
Body Mass Index (kg/m ²)	15.79 (1.22)	16.44 (1.21)	$F(1,159)=8.46^*$
Binge/Purge Episodes ^{<i>l</i>}	0.03 (0.2)	15.67 (21.03)	$F(1,159)=66.72^{**}$

*
 $p<0.01$,**
 $p<0.001$ ^{*l*} Binge/purge episodes in the last month

TABLE 2

Reported meal and snack consumption on the EDE in the past 28 days with age and BMI as covariates, M (SD)

	Full Sample (n=160)	Restricting AN (n=120)	Binge Purge AN (n=40)	Test Statistic
Breakfast	23.4(8.1)	24.7(6.8)	19.8(10.3)	$F(2,158)=9.25^{**}$, Partial $\eta^2=.056$
Mid-morning Snack	7.3(9.2)	8.2(9.6)	4.4(7.2)	$F(2,158)=5.59^*$, Partial $\eta^2=.035$
Lunch	22.9(7.8)	24.5(6.6)	18.2(9.3)	$F(2,158)=18.64^{***}$, Partial $\eta^2=.107$
Mid-afternoon Snack	14.7(10.3)	15.6(10.3)	11.7(9.5)	$F(2,158)=5.66^{**}$, Partial $\eta^2=.035$
Dinner	25.3(5.7)	26.2(4.4)	22.5(7.3)	$F(2,158)=12.12^{**}$, Partial $\eta^2=.072$
Evening Snack	12.9(10.1)	13.5(10.3)	11.5(9.3)	$F(2,158)=3.74$, Partial $\eta^2=.023$
Meals per day	2.55(.63)	2.69(.51)	2.16(.80)	$F(2,158)=19.82^{***}$, Partial $\eta^2=.113$
Snack per day	1.24(.86)	1.33(.89)	.98(.67)	$F(2,158)=7.54^{**}$, Partial $\eta^2=.046$

*
 $p<0.05$,

**
 $p<0.01$,

 $p<0.001$

TABLE 3

Correlations between meal and snack consumption and eating disorder behaviors among patients with AN-BE/P

	Objective Binge Eating Episodes ^I	Purging Episodes ^I
Breakfast	-.089	-.309*
Morning Snack	-.122	-.249
Lunch	-.038	-.189
Afternoon Snack	.214	-.040
Dinner	-.379*	-.091
Evening Snack	.117	-.243

*
 $p < 0.05$

^I Number of episodes in the last month