Abnormal eating behavior in video-recorded meals in anorexia nervosa

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ABSTRACT

Objective: Eating behavior during meals in anorexia nervosa (AN) has long been noted to be abnormal, but little research has been done carefully characterizing these behaviors. These eating behaviors have been considered pathological, but are not well understood. The current study sought to quantify ingestive and non-ingestive behaviors during a laboratory lunch meal, compare them to the behaviors of healthy controls (HC), and examine their relationships with caloric intake and anxiety during the meal.
Method: A standardized lunch meal was video-recorded for 26 individuals with AN and 10 HC. Duration, frequency, and latency of 16 mealtime behaviors were coded using computer software. Caloric intake, dietary energy density (DEDS), and anxiety were also measured.
Results: Nine mealtime behaviors were identified that distinguished AN from HC: staring at food, tearing food, nibbling/picking, dissecting food, napkin use, inappropriate utensil use, hand fidgeting, eating latency, and nibbling/picking latency. Among AN, a subset of these behaviors was related to caloric intake and anxiety.
Discussion: These data demonstrate that the mealtime behaviors of patients with AN and HC differ significantly, and some of these behaviors may be associated with food intake and anxiety. These mealtime behaviors may be important treatment targets to improve eating behavior in individuals with AN.

1. Introduction

The eating behavior of individuals with anorexia nervosa (AN) is aberrant in a number of ways. Individuals with AN engage in extreme dietary restriction by avoiding consumption of high fat foods and by restricting their overall caloric intake to maintain low weight (Affenito, Dohm, Crawford, Daniels, & Striegel-Moore, 2002; Walsh, 2011). One emerging line of research has examined the relationship between dietary patterns in AN toward the end of inpatient treatment and outcomes one year after discharge. In these studies, patients with AN who had been weight-restored provided food records for the four days prior to discharge (Schebendach, Mayer, Devlin, Attia, & Walsh, 2012; Schebendach et al., 2011). Those with poor outcomes at one year follow-up had significantly lower diet variety scores (the cumulative number of foods and beverages consumed), dietary energy density scores (DEDS, kcal/g), and fraction of calories deriving from fat intake. These studies indicate that specific facets of dietary intake in AN have implications for the longer term course of the illness, and further exploration is warranted.

In addition, it has long been clinically noted that AN is characterized by abnormal mealtime behaviors. In fact, many examples of these aberrant mealtime behaviors have been enumerated in the Yale Brown Cornell-Eating Disorder Severity Scale (YBC-EDS; (Sunday, Halmi, & Einhorn, 1995)), a semi-structured interview measuring the presence of ritualistic eating disordered behaviors in the past month. The YBC-EDS conceptualizes many of these behaviors, such as excessively cutting or tearing foods, as rituals analogous to those found in obsessive–compulsive disorder (OCD). Rituals in AN may be in the service of managing anxiety around eating (Steinglass et al., 2011).

Despite the common clinical observation that patients with AN frequently exhibit abnormal eating behaviors, there are few objective data available regarding these mealtime behaviors. Wilson, Touyz, Dunn, and Beumont (1989) developed a rating scale to measure aberrant mealtime behaviors in AN and compare them to those of healthy controls. This scale measured frequency and intensity of behaviors using Likert scales rated after the entire meal had been viewed. While potentially useful for charting clinical progress, this scale does not quantify behavior and the ratings are completed retrospectively at the end of the meal. Sunday and Halmi (1996) also conducted a study examining the mealtime patterns of individuals with AN. This study did quantify the number of times a participant paused between bites, but other common mealtime behaviors were not assessed. Tappe, Gerberg, Shide, Andersen, and Rolls (1998) completed a comprehensive assessment and quantification of video-recorded mealtime behaviors in AN and compared them to healthy controls though the use of computer coding software. Results demonstrated that patients with AN spent more time during meals engaged in behaviors related to food arrangement and preparation. This study is the single report of objective measurement of mealtime behavior; however, the study design did not

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allow for exploration of the relationship between these mealtime behaviors and caloric intake. With improvements in digital technology, we can now better and more accurately assess a range of mealtime behaviors, thus allowing us to better characterize the role mealtime behaviors might play in eating pathology.

Our first aim was to develop, validate, and pilot an approach for assessing ingestive and non-ingestive mealtime behaviors of individuals with AN using a videotaped assessment of a lunch meal. Successful implementation of this assessment approach would then allow us to pursue a second aim, which was to identify behaviors that distinguish patients from their healthy peers, and explore the relationships between these behaviors and anxiety and caloric intake. We hypothesized that (1) patients with AN would be distinguishable from healthy controls based upon the pattern of mealtime behaviors measured, (2) among patients, frequency and duration of meal-time behaviors would be related to caloric intake, and (3), among patients, frequency and duration of meal-time behaviors would be related to anxiety.

2. Method

2.1. Participants

2.1.1. Patients with anorexia nervosa

Participants were individuals between the ages of 16 and 45 years who met DSM 5 criteria for AN at the time of hospital admission (American Psychiatric Association, 2013). Participants with AN were receiving standard inpatient behaviorally-based treatment for AN at the New York State Psychiatric Institute (NYSPI; (Attia & Walsh, 2009)), where they had achieved partial weight restoration to near normal weight (body mass index (BMI) ≥ 18.5 kg/m^2). Patients with AN were enrolled in a randomized controlled trial (RCT) comparing two psychotherapeutic approaches (exposure and response prevention for AN vs. cognitive remediation therapy) which began once patients had achieved weight restoration to 80% of ideal body weight. On average, patients with AN had been in the hospital for 4.9 ± 2.5 weeks (range: 1.3 to 11.1 weeks) before study procedures began. The laboratory meal in the present study served as a baseline assessment prior to randomization in the psychotherapy study. Patients were excluded if they had OCD, or a different axis I disorder requiring immediate clinical intervention, or acute suicidality (see Steinglass et al., 2014 for details (Steinglass et al., 2014)).

2.1.2. Healthy controls

Ten age-matched, normal weight female healthy controls (HC) were recruited via advertisement to participate. HC were included if they had no current or past psychiatric illness, including any history of an eating disorder, and had a BMI in the normal range (18–25 kg/m^2). Additional exclusion criteria for HC were the presence of significant medical illness, current use of psychotropic medication, or current food allergies or food restrictions incompatible with foods to be consumed during the laboratory lunch meal (described below). Psychiatric diagnoses were assessed by the Structured Clinical Interview for DSM-IV and the Eating Disorder Examination (Cooper & Fairburn, 1987; First, Spitzer, Gibbon, & Williams, 2007).

All participants provided written informed consent in accordance with the New York State Psychiatric Institute Institutional Review Board (Clinical Trials Registry: NCT00627341).

2.2. Study design

Patients with AN participated in a videotaped laboratory lunch meal as a baseline assessment before beginning treatment in the RCT. Separately, a group of healthy controls were recruited to participate in a videotaped meal, following the same procedures. All participants consented to being videotaped during this meal.

2.2.1. Laboratory meal

All participants received a standardized breakfast (300 kcal) at 8 am with nothing to eat or drink between breakfast and the study meal, 4 h later (Steinglass et al., 2012). The lunch meal was comprised of a large turkey and cheese sandwich (600 kcal), a squeeze bottle of mayonnaise, a bowl of potato chips (455 kcal), and a small bottle of water (8 oz). Participants were instructed that this was their lunch for the day, that they should eat a self-determined "appropriate amount," and to press the bell when they were done. Thus, meal length and amount were variable and determined by the participant. All meals were video-recorded (Sony Handycam DCR-SR62). Intake was calculated by measuring the weight of the food (Acculab 7200 balance) before and after the meal and calculating calories consumed based on kilocalories per gram weight of the foods. Diet energy density (DEDS) was calculated as caloric intake (in kilocalories) divided by the total weight (in grams) of food and beverages consumed.

2.2.2. Meal coding

Video-recordings of the meals were viewed by three independent raters and the ingestive and non-ingestive mealtime behaviors of the study participants were coded using stopwatch + (Center for Behavioral Neuroscience) computer software which allows for the simultaneous monitoring of the frequency, latency, and duration of up to 16 behavior categories. The sixteen behavior categories examined in this study were: eating, drinking, arranging/inspecting, staring at food, body checking, nibbling, dissecting, blotting, cutting, odd food combinations, putting down utensils between bites, inappropriate utensil use, napkin use, tearing food, rocking, and hand fidgeting (description of behaviors available in Supplementary materials; coding manual available upon request). A subset of these behaviors was coded only for frequency, others were coded for frequency and duration, and others were also coded for latency (i.e., time elapsed before the first appearance of the behavior; see Table 1). Co-occurring behaviors were coded simultaneously. For example, if a participant was eating the sandwich and also using a fork to bring the sandwich pieces to her mouth, both "eating" and "inappropriate utensil use" categories were coded.

To establish interrater reliability, a subset of meals (15%, chosen at random) was coded separately by all three independent raters and intraclass correlation coefficients (ICC) were calculated. Guidelines that suggest that ICC's ≤ 0.70 are considered poor, 0.70–0.79 are considered adequate, 0.80–0.89 are considered good, and ≥ 0.90 are considered excellent, were used in the current study (Hunsley & Mash, 2008).

2.2.3. Psychological assessment

The presence of ritualistic eating disordered behaviors was assessed at baseline using the Yale Brown Cornell Eating Disorder Severity Scale (YBC-EDS), a semi-structured interview (Sunday et al., 1995). Eating-

Table 1
Demographic variables of patients with AN and healthy controls.

	Healthy controls ($n = 10$)	Patients with AN ($n = 26$)	W	p value
Age (years)	27.6 ± 5.2	27.8 ± 8.3	218	.698[§]
BMI (kg/m^2)	20.7 ± 1.1	19.1 ± 0.6	321	<.001[§]
YBC-EDS total score	0 ± 0	18.2 ± 6.4	55	<.001[§]
Pre-meal STAI-S	22.3 ± 3.8	54.5 ± 13.5	60	<.001[§]
Mean SUDS	0.34 ± .67	5.14 ± 2.54	60	<.001[§]
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Length of meal (min)	13.2 ± 4.3	15.6 ± 5.8	1.19	.242
INTAKE (kcal)	553.0 ± 146.4	420.5 ± 279.6	−1.18	.246
Rate of eating (kcal/min)	44.0 ± 11.6	26.6 ± 17.5	−2.91	.006
DEDS (kcal/g)	1.2 ± .2	0.9 ± .4	−2.04	.048

Note. BMI = Body Mass Index; DEDS = Dietary Energy Density Score; STAI-S = State Trait Anxiety Inventory, State version; SUDS = Subject Units of Distress; W¯ = Wilcoxon Statistic; YBC-EDS = Yale Brown Cornell-Eating Disorder Severity Scale.
[§] p value from Wilcoxon test for variables that did not pass Shapiro–Wilk test for normality.