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Food choice and diet variety in weight-restored patients with anorexia nervosa

Janet E. Schebendach, Ph.D., R.D.,

Assistant Professor of Clinical Neurobiology in Psychiatry, Columbia University Medical Center, New York State Psychiatric Institute, Eating Disorders Research Unit, 1051 Riverside Drive, New York, NY 10032, Tele:212-543-0320, Fax: 212-543-5607, js2202@columbia.edu

Laurel E. Mayer, M.D.,

Assistant Professor of Clinical Psychiatry, College of Physicians & Surgeons, Columbia University, New York State Psychiatric Institute, Eating Disorders Research Unit, 1051 Riverside Drive, New York, NY 10032, Tele:212-543-5741, Fax: 212-543-5607, lsm16@columbia.edu

Michael J. Devlin, M.D.,

Professor of Clinical Psychiatry, College of Physicians & Surgeons, Columbia University, New York State Psychiatric Institute, Eating Disorders Research Unit, 1051 Riverside Drive, New York, NY 10032, Tele:212-543-5748, Fax: 212-543-5607, mjd5@columbia.edu

Evelyn Attia, M.D.,

Clinical Professor of Psychiatry, College of Physicians & Surgeons, Columbia University, New York State Psychiatric Institute, Eating Disorders Research Unit, 1051 Riverside Drive, New York, NY 10032, Tele:212-543-5923, Fax: 212-543-5607, ea12@columbia.edu

Isobel R. Contento, Ph.D.,

Mary Swartz Rose Professor of Nutrition and Education, Teachers College, Columbia University, Department of Health and Behavior Studies, Program in Nutrition, 125 W 120th Street, Thorndike Building, Rm. 530B, New York, NY 10027-6696, Tele: 212-678-3949, Fax: 212-678-8259, irc@columbia.edu

Randi L. Wolf, Ph.D., and

Associate Professor of Human Nutrition, Teachers College, Columbia University, Department of Health and Behavior Studies, Program in Nutrition, 125 W 120th Street, Thorndike Building, Rm. 530D, New York, NY 10027-6696, Tele: 212-678-3912, Fax: 212-678-8259, Wolf@tc.columbia.edu

B. Timothy Walsh, M.D.

Professor of Psychiatry, College of Physicians & Surgeons, Columbia University, New York State Psychiatric Institute, Eating Disorders Research Unit, 1051 Riverside Drive, Unit 98, New York, NY 10032, Tele:212-543-5752, Fax: 212-543-6606, btw1@columbia.edu

Abstract

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Address correspondence to: J. Schebendach Ph.D., R.D., New York State Psychiatric Institute, 1051 Riverside Drive, Unit 98, New York, NY, 10032. Tele: 212-543-0320; Fax: 212-543-5607; js2202@columbia.edu.

Address request for reprints to: J. Schebendach Ph.D., R.D., New York State Psychiatric Institute, 1051 Riverside Drive, Unit 98, New York, NY 10032., Tele: 212-543-0320; Fax: 212-543-5607; js2202@columbia.edu

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Anorexia nervosa (AN) is a serious psychiatric illness associated with significant morbidity and mortality. Weight-restored females with AN with limited diet variety, assessed by a diet variety score, have been reported to have poor outcome. Using the same patient cohort, the objective of the current study was to provide a detailed description of the types of foods from which patients restrict variety in their diets. Forty-one weight-restored patients, hospitalized between June 2000 and July 2005, who completed a four-day food record prior to discharge were followed for up to one-year. Patient outcome was categorized as a success ($n=29$) or failure ($n=12$) using Morgan-Russell criteria. Although the total number of foods selected did not differ between the success and failure groups (73 ± 14 vs. 74 ± 13 respectively, $P = 0.741$), a significant difference in the total number of different foods was observed: the failure group selected fewer and the success group selected more (43 ± 9 vs. 51 ± 7 , $P = 0.005$). Outcome groups also differed significantly in the variety of foods selected from 5 out of 17 food groups. Results suggest that a diet limited in total variety and specifically limited in variety from five food groups may be associated with relapse in patients with AN.

Keywords

Anorexia nervosa; food choice; diet variety; weight restoration; treatment outcome

INTRODUCTION

Anorexia nervosa (AN) is a serious psychiatric illness associated with significant morbidity (1) and mortality (2, 3). Treatment programs are largely successful in the restoration of body weight; however, recidivism is common, and the rate of relapse is estimated to be as high as 50% (4). Patients with AN restrict their food consumption leading to decreased energy and nutrient intakes. Additionally, these individuals characteristically restrict food choice (5–9), affecting variety in the diet, both across and within food groups. Inpatient programs typically provide varied diets of sufficient energy content to promote the restoration of a healthy body weight. Nevertheless, the high relapse rate suggests that many patients have difficulty maintaining a healthful diet after hospital discharge.

In normal weight, overweight, and obese individuals, increased diet variety is associated with increased energy intake (10–17), and limited diet variety is associated with decreased energy intake (18–20) and weight loss (19, 21). Limited diet variety may lead to food monotony and decreased energy intake (20). Highly palatable foods are more resistant to the monotony effect, whereas less palatable foods tend to amplify this effect (22, 23). Clinical observation suggests that patients with AN generally consume a limited number of less palatable foods and simultaneously avoid those which are generally more palatable. Few studies, however, have obtained objective measures to assess such behavior.

It was previously reported that limited diet variety, assessed by a diet variety score, was associated with worse outcome during the one-year period immediately following inpatient weight restoration (24). Using the same patient cohort, the objective of the current study was to provide a detailed description of the types of foods from which patients restrict variety in their diets.

METHODS

Participants

This study is a secondary analysis of data previously reported (24). Participants were 41 women with AN between the ages of 18 to 45 years who were hospitalized for treatment on the Eating Disorders Service of the New York State Psychiatric Institute (NYSPI) at

Columbia University Medical Center, between June 2000 and July 2005. The Institutional Review Board of the NYSPI approved this secondary data analysis.

Participants met the AN criteria (except amenorrhea) of the Diagnostic and Statistical Manual for Mental Disorders, Fourth Edition (DSM-IV) (25). The amenorrhea criterion of the DSM-IV was not strictly applied because few differences in illness history, treatment response, and general psychopathology have been observed between women with AN and women meeting all of the DSM-IV criteria for AN except amenorrhea (26). Moreover, it is currently proposed that the amenorrhea criterion be deleted from the upcoming DSM-5 (27).

Inpatient treatment was previously described (24) and consisted of a structured behavioral program aimed at normalizing eating behavior and restoring body weight to a minimum of 90% IBW (1, 28), approximately equal to a BMI of 20 kg/m². Patients were prescribed three meals and one snack daily and were to gain ≥ 1 kg per week. Additional calories from Ensure Plus (Abbott Nutrition, White Plains, NY) were provided if energy intake was not sufficient. Initially, patients were prescribed an 1800 kcal, 30% fat diet that was selected by the hospital's clinical registered dietitian; all meals and snacks were eaten under supervision. Calorie prescriptions were increased to approximately 3000 kcal/day over 2.5 weeks.

At 80% IBW, patients were permitted to make their own food choices from the hospital menu. At 90% IBW, patients were eligible for and encouraged to eat meals during passes outside the hospital. Meal passes were reviewed in advance by the RD and approved by the treatment team; however, compliance with the prescribed diet was not monitored when meals were eaten outside the hospital.

Diet assessment

Patients completed a prospective four-day food record after maintaining ≥ 90 % IBW for two to four weeks. A trained research assistant provided detailed verbal and written instructions on estimation of food portions, and a pictorial. Completed records, reviewed for accuracy and completeness by a registered dietitian, were entered into NUTRITIONIST PRO software (version 1.2.207, 2003, First DataBank, Inc., San Bruno, CA). Analyses were conducted without knowledge of patients' treatment outcome.

The food records were manually coded by a registered dietitian to determine total food choice; this is referred to as the total number of food items selected. A food item was counted each time it was selected, regardless of quantity. The food records were also coded to determine total diet variety; this is referred to as the total number of different/unique food items selected. Even if consumed on multiple occasions, a food item was counted only once (10, 29), regardless of quantity (10, 30). To determine the degree to which foods were repeatedly chosen, a ratio was calculated to compare the total number of food items selected to the total number of different/unique food items selected.

The food records were also reviewed to determine the variety of foods selected from 17 food groups: total complex carbohydrate and three carbohydrate subgroups (breads, cereals, starches); total protein and two protein subgroups (animal, vegetable); casseroles and mixed entrees; fruits; vegetables, yogurt and cheese; desserts and sweet snacks; savory snacks; added fats; added sugars; miscellaneous foods; and caloric beverages. Food groups were based on established guidelines for patients' meal planning used at the NYSPI. A specific food was counted as a distinct item if it was prepared in an obviously different manner (e.g., mashed or baked potato) or was of a different variety (e.g., brown or white rice). Each vegetable was counted as a distinct item; however, it was counted once if prepared in a fat-free manner (e.g., boiled) and counted a second time if prepared with the addition of fat (e.g., stir-fried). Likewise, a specific cut of meat or poultry or a specific type of fish was

counted once if prepared in a fat-free manner (e.g., grilled) and counted a second time if prepared with the addition of fat (e.g., deep-fried). Different varieties of juice were distinct, as were different forms of the same fruit (e.g., fresh or canned). Casseroles and mixed entrees (e.g., pizza) were counted as a complete unit and were not broken down to component ingredients. Distinct types of nutritive sweeteners (e.g., granulated or brown sugar) were each counted once, as were distinct types of added fats (e.g., mayonnaise, butter). Noncaloric fluids (e.g., black coffee, water), non-nutritive sweeteners (e.g., aspartame, saccharin), and condiments (e.g., salt, pepper, ketchup, mustard) were not counted.

Post-hospitalization follow-up

As previously described (24), weight-restored patients were assessed in the hospital and followed for up to one-year post discharge. A research psychiatrist using the modified Morgan-Russell (MR) criteria (2, 31; Figure 1) determined participant outcome at study termination. Consistent with previous reports (24, 32, 33, 34), patients who met MR criteria for a full, good, or fair outcome were included in the treatment success group ($n = 29$) and those who met MR criteria for a poor outcome were included in the treatment failure group ($n = 12$). All between-group comparisons were based on this method of dichotomizing treatment outcome.

Statistical analyses

The Student's *t*-test was used to compare total food choice and total diet variety between the success ($n=29$) and failure ($n=12$) groups. Treatment outcome groups were also compared to determine if there were differences in the variety of foods selected from 17 food groups. Means + SDs are reported; *t*-tests were 2-tailed; effect size (Cohen's *d*) was calculated. Statistical significance was set at $P < 0.05$. Because of the exploratory nature of these analyses, these data were not corrected for multiple comparisons. Data analysis did not control for outpatient treatment. Analyses were performed by using SPSS for Windows software (version 16.0, 2008, SPSS, Chicago, IL).

RESULTS and DISCUSSION

Forty-one patients were categorized as treatment success ($n=29$) or treatment failure ($n=12$). Details of participants' clinical characteristics were previously reported (24). In summary, there was no significant between-group difference in age (22.2 ± 3.6 vs. 21.5 ± 3.4 yrs), admission BMI (15.5 ± 1.4 vs. 14.6 ± 1.3 kg/m²), or weight-restored BMI (20.6 ± 0.8 vs. 20.4 ± 0.8 kg/m²). There was, however, a significant between-group difference in BMI at follow-up (19.6 ± 1.3 vs. 16.1 ± 1.1 kg/m²).

Details regarding energy and macronutrient intake of study participants were previously reported (24). In brief, prior to hospital discharge, energy intake was similar ($P = 0.16$) between the success (2415.5 ± 532.4) and failure (2175.1 ± 355.5) groups. The failure group consumed significantly ($P = 0.012$) less total fat (52.2 ± 14.7 g) than the success group (68.5 ± 19.1 g). Accordingly, the percentage of energy from fat was also significantly ($P = 0.012$) lower in the failure group ($21 \pm 3.8\%$) compared to the success group ($25.2 \pm 5.1\%$).

Total food choice was similar ($P = 0.741$) for the success (72.86 ± 13.68) and failure (74.42 ± 13.43) groups. In contrast, total diet variety differed significantly ($P = 0.005$), with the success group selecting more (50.66 ± 6.75) and the failure group selecting less (43.08 ± 8.7) variety. The ratio of total food items selected to total number of different/unique food items selected indicated that the failure group repeated a food choice 1.75

times, while the success group repeated a food choice 1.44 times ($P = 0.001$). Stated another way, the treatment success group selected a different food 71% of the time, whereas the failure group selected a different food only 58% of the time.

As indicated in Table 1, the treatment outcome groups differed significantly in the variety of foods chosen from five food groups: added fats, added sugars, caloric beverages, starchy carbohydrates, and miscellaneous foods. The success group selected significantly more and the failure group significantly less variety from the added fat group, and the caloric beverage group. Significant differences in the variety of added sugars and miscellaneous foods (e.g. pasta sauce) were also observed. It is speculated that foods like added sugars and sauces typically make foods more palatable and their omission is likely to have the opposite effect. The failure group also selected less variety from the starchy carbohydrate group (e.g., rice, pasta, potato); restricted choice from such a diverse food group is likely to affect long-term adequacy of caloric intake.

Studies suggest that greater diet variety, particularly from highly palatable food groups, is associated with greater food intake (11–16), whereas restricted variety is likely to result in less food intake and possible weight loss (14, 18, 19). McCrory and colleagues (12) determined that total diet variety was positively associated with increased energy consumption over a six-month period in healthy adults. Furthermore, variety from the fat-containing condiments, added sweets and sugars, and complex carbohydrates food groups was positively associated with body fatness. Raynor and colleagues (19) examined change in diet variety during an obesity intervention. Results indicated that decreased variety in the fats, oils, and sweets group, and the high-fat foods group, was associated with reduced energy intake and weight loss over an 18-month period. Raynor and colleagues (18) examined low-fat and high-fat food group variety in adults with a minimum 30-lb, long-term weight loss, from the National Weight Control Registry. Compared to a recent weight loss group, registry participants consumed significantly less variety in almost all food groups, but particularly from the high-fat food groups. Likewise, Lyles and colleagues (35) determined that a macronutrient-based fat variety score was positively associated with BMI in overweight adults.

It appears that eating behavior changes precede changes in body weight. Despite these significant differences in variety, no significant difference in BMI or total energy intake was observed prior to hospital discharge. It is speculated that continued restriction of overall diet variety, purposeful restriction of highly palatable food groups, and food monotony that resulted from repeated food exposure, culminated in decreased energy intake and weight loss over the one-year period following hospital discharge.

There are several limitations to this study. First, and foremost, the sample size is small. Yet, it should be noted that it is challenging to obtain an adequate sample size for research studies when there is an approximate 0.5% to 1% prevalence of clinical anorexia nervosa during late adolescence or among adult women (25). Food records are subjective. While normal-weight (36) and overweight (37) persons tend to underreport food intake, individuals with AN have been observed to either over-report (6, 38), or accurately report (8, 39–41) food intake. A standardized approach to categorizing foods into diet variety groups is lacking. Hence, methodological differences limit comparisons across studies. The diet variety groups used in the current study were derived from NYSPI's menu planning protocol; other food-grouping approaches may have led to different results. Finally, this was a secondary data analysis. Nevertheless, this exploratory study provides a detailed description of diet variety in recently weight-restored patients with AN. Given the paucity of research on food choice in this population, these descriptive data may suggest targets for treatment interventions.

CONCLUSION

There has been surprisingly little research on food choice in individuals with AN, and, to our knowledge, none that has provided a detailed description of diet variety in recently weight-restored patients. There are few evidence-based guidelines for the management of weight-restored patients with AN. The current study suggests that consumption of a varied diet may be related to improved outcome in AN. Future studies with larger patient samples are needed to replicate the current results and to elucidate those aspects of diet variety that most directly contribute to relapse in weight-restored patients with AN.

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Outcome	Definition
Full	No DSM-IV [*] criteria for a minimum of 8 weeks
Good	Body Mass Index ≥ 15.5 , normal menses May have some binge eating or purging behaviors or psychological symptoms of Anorexia Nervosa
Fair	Body Mass Index ≥ 15.0 , amenorrhea
Poor	Body Mass Index < 15.0

* Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV), American Psychiatric Association, 1994.

Figure 1.
Definition of modified Morgan-Russell criteria for patients with Anorexia Nervosa

Table 1

Number of different/unique food items selected by the treatment success and treatment failure outcome groups ^a two to four week after attaining 90% ideal body weight during inpatient hospitalization.

Food Group	Treatment success group		Treatment failure group		Analysis ^b	
	(n = 29)		(n = 12)		P	Cohen's <i>d</i>
Protein:						
Animal	5.03	+/- 1.74 ^c	4.58	+/- 1.51	0.438	0.276
Vegetable	0.86	+/- 0.92	1.17	+/- 1.12	0.369	-0.303
Total	5.90	+/- 1.52	5.75	+/- 1.42	0.776	0.102
Complex Carbohydrate:						
Bread	4.72	+/- 1.33	4.58	+/- 1.88	0.787	0.086
Cereal	3.17	+/- 1.31	3.25	+/- 1.71	0.876	-0.053
Starch	3.41	+/- 1.52	2.25	+/- 1.22	0.024 *	0.842
Total	11.31	+/- 2.66	10.08	+/- 3.83	0.246	0.373
Yogurt & Cheese	2.10	+/- 1.01	2.00	+/- 1.48	0.797	0.079
Fruit	3.31	+/- 2.00	4.00	+/- 2.26	0.339	-0.323
Vegetable	7.66	+/- 2.77	6.58	+/- 2.35	0.247	0.421
Casseroles/ Mixed Entree	1.17	+/- 1.08	0.83	+/- 0.84	0.334	0.351
Desserts/Sweet Snack	6.55	+/- 2.76	5.42	+/- 2.23	0.215	0.45
Savory Snack	1.52	+/- 0.87	1.33	+/- 1.67	0.645	0.143
Added Sugar	1.45	+/- 0.69	0.75	+/- 0.62	0.004 **	1.067
Added Fat	3.28	+/- 1.49	2.08	+/- 1.08	0.016 *	0.922
Miscellaneous Foods	0.62	+/- 0.94	0.08	+/- 0.29	0.009 **	0.776
Caloric Beverage	5.76	+/- 2.15	4.17	+/- 2.04	0.035 *	0.759

^a Morgan-Russell criteria for success were a full, good, or fair outcome; for failure, they were a poor outcome (see reference 2 and 34).

^b *P* values were obtained with Student's *t* test. Cohen's *d* refers to effect size.

^c Mean $\pm$ SD (all such values).

* *P* < 0.05

** *P* < 0.01