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Confronting Fear Using Exposure and Response Prevention for Anorexia Nervosa: A Randomized Controlled Pilot Study

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Abstract

Objective—Anorexia nervosa (AN) is a severe illness with high rates of relapse. Exposure and Response Prevention for AN (AN-EXRP) is a new approach that specifically addresses maladaptive eating behavior by targeting eating-related fear and anxiety. The aim of this study was to evaluate AN-EXRP as an adjunctive strategy to improve eating behavior during weight restoration, at a pivotal moment when treatment goals shift toward relapse prevention.

Method—A randomized controlled trial was conducted to compare AN-EXRP with a comparison condition, Cognitive Remediation Therapy (CRT). Hospitalized patients with AN (n=32) who had achieved weight restoration to a BMI > 18.5 kg/m² received 12 sessions of either AN-EXRP or CRT. Outcome was assessed by change in caloric intake in an objective assessment of eating behavior.

Results—The average test meal caloric intake of participants who received AN-EXRP increased from 352±263 kcal at baseline to 401±215 kcal post-treatment, while that of participants who received CRT decreased from 501±232 kcal at baseline to 424±221 kcal post-treatment (t(28)=2.5, p=0.02). Improvement in intake was significantly associated with improvement in eating-related anxiety (Spearman's ρ =0.40, p=0.03).

Conclusions—These data demonstrate that AN-EXRP, compared to a credible comparison intervention, is associated with better caloric intake in a laboratory meal over time in AN. Additional studies are required to determine whether incorporation of these techniques into a longer treatment program leads to enduring and clinically significant change.

Maladaptive eating behavior is a central component of AN: patients engage in rigid dietary patterns that do not meet their nutritional needs. Structured behaviorally-oriented programs for AN are successful in achieving substantial weight gain.¹ Yet relapse rates are high, with as many as 30–50% of adult inpatients requiring re-hospitalization within one year of discharge.² Thus, weight restoration, a critical first step, is not adequate to achieve lasting remission from AN, especially among adults. Recent studies using objective assessments have demonstrated that independent eating behavior changes little during acute treatment, despite substantial improvement in psychological symptoms.^{3–4} Notably, individuals with AN have elevated levels of anxiety⁵ and describe extreme beliefs about the potential consequences of eating. Many eating-related rituals are organized around managing these fears,⁶ and caloric intake is associated with pre-meal anxiety.⁷ Together these clinical phenomena suggest that eating related anxiety may be an important – and underutilized – target for treatment interventions.

We developed an intervention to target eating-related fear and anxiety directly: Exposure and Response Prevention for AN (AN-EXRP). Exposure and response prevention is a form of Cognitive Behavioral Therapy that engages patients in the task of confronting, rather than avoiding, fears and experiencing decreasing anxiety over time. It is the treatment of choice across anxiety disorders.⁸ Exposure and response prevention has been previously developed and evaluated in the treatment of bulimia nervosa, with some success.^{9–11} While investigation of exposure and response prevention for BN has not persisted, presumably due to the availability of other successful treatments, the core concepts are consistent with standard CBT for AN, providing a foundation for the development of formal AN-EXRP. Eating behavior (change in caloric intake) was chosen as the proximal measure of treatment effect in partially weight restored older adolescents and adults prior to discharge, as previous research has shown that eating patterns prior to discharge are related to such individuals' ability to maintain longer-term health.^{12–13} In the current study, we used a randomized, controlled design to compare AN-EXRP to Cognitive Remediation Therapy (CRT) as adjunctive treatments in an intensive treatment setting. We hypothesized that a short-term course of AN-EXRP would lead to detectable improvement in eating behavior as compared with CRT. Secondly, we hypothesized that individuals who received AN-EXRP would show greater improvement in eating related anxiety and that this change would be associated with increases in caloric intake.

METHOD

Study Design

This study was a 4 week randomized controlled trial to evaluate the short-term effects of adjunctive AN-EXRP on caloric intake in a laboratory setting in patients with AN who were receiving treatment on an inpatient research unit. Cognitive remediation therapy (CRT) was selected as a comparison condition as it has been developed for use among inpatients with AN^{14–15} to improve outcome through improving mental flexibility, and therefore provides a control for the experimental experiences of receiving an additional form of psychotherapy and having a study therapist. There is no evidence, to date, that CRT is associated with an increase in caloric intake.

Participants

Eligible participants were individuals between the ages of 16 and 45 years who met criteria for AN, with or without amenorrhea^{16–17} at the time of hospital admission. Exclusion criteria were other Axis I disorders requiring immediate clinical intervention or acute suicidality. Individuals with concurrent obsessive compulsive disorder were excluded as AN-EXRP (unlike CRT) was developed based on exposure and response prevention that is a known, effective treatment for obsessive compulsive disorder.¹⁸ Psychiatric diagnoses were confirmed by the Structured Clinical Interview for DSM-IV¹⁹ and the Eating Disorder Examination.²⁰ All participants were receiving standard inpatient behaviorally-based eating disorder treatment at the New York State Psychiatric Institute (NYSPI).¹ Patients were recruited and enrolled in this study when they had achieved near normal weight (body mass index (BMI) ≥ 18.5 kg/m²) during their stay on the research unit based on the rationale that eating behavior at this phase of treatment – prior to hospital discharge – has been shown to be predictive of longer term health.^{12–13} After complete description of the study to the subjects, all participants provided written informed consent in accordance with the NYSPI Institutional Review Board.

Randomization

Patients were randomly assigned to receive either AN-EXRP or CRT, using a computer-generated block randomization procedure. Patients were informed of their treatment assignment after completion of baseline assessments.

Treatment

Both study treatments included a total of 12 sessions delivered 3 times per week over 4 weeks (90 minute sessions for AN-EXRP, 45 minute sessions for CRT). Each treatment included a group session between individual sessions. All study therapists provided both treatments. Participants were offered a course of up to 4 weeks of the alternate treatment after completion of the study.

Exposure and Response Prevention for AN (AN-EXRP):^{6, 21}—AN-EXRP is a manualized treatment that adapts exposure and response prevention techniques to address eating-related fear and anxiety, with the goal of improving eating behavior in AN, with an emphasis on ritual prevention as well as exposure.²² During individual sessions, the patient is exposed *in-session* to feared eating situations (e.g., holding a sandwich and eating it) without the use of anxiety-reducing rituals (e.g. breaking it into small pieces) that are selected from the individual's detailed hierarchy of feared eating situations, moving from least anxiety-provoking to most over subsequent sessions. Therapist interventions serve to maintain contact with the feared stimulus, increase awareness of anxiety and of habituation. Between sessions, the patient is asked to practice self-guided exposures and monitor anxiety and rituals, including excessive physical activity and rituals related to body image.

Cognitive Remediation Therapy for AN (CRT)—CRT for AN is a manual-based treatment, described by Tchanturia et al.^{15, 23} that addresses cognitive impairments in AN. Treatment consists of cognitive exercises to enhance cognitive flexibility. Sessions consist of a series of exercises that target a particular cognitive skill, including attention, memory, and executive function, as well as relating cognitive exercises to the individual's life experience. In Sessions 7–12, the patient is asked to practice cognitive exercises between sessions.

Therapist Training and Treatment Fidelity—Therapists were PhD level clinicians with experience treating patients with eating disorders. Training included manual review and completion of at least one training case of each type under supervision. Consultation was provided by experts in exposure and response prevention therapy (A.M.A and H.B.S) and CRT (K.T. and J.L.). Therapists attended weekly, ongoing supervision with the study P.I., separated by treatment type. Therapy sessions were video or audiotaped. Therapist adherence to each study treatment was assessed by rating use of core treatment interventions. Videotapes or audiotapes of ten percent of all sessions were reviewed by 3 study clinicians and adherence to treatment by all 4 study therapists was confirmed, with 100% adherence.

Assessments

Height and weight were measured by stadiometer and balance scale, respectively (Detecto scale, Model R49944). Patients participated in assessments of eating behavior and completed psychological measures prior to randomization (baseline) and post-treatment.

Eating behavior—The primary outcome measure was change in caloric intake between the baseline and post-treatment laboratory lunch meal. Prior to randomization, patients participated in an adaptation meal followed by a baseline meal. The procedures for all study

meals were identical. On the morning of each test meal day, participants received a standardized breakfast (300 kcal) at 8 am and had nothing to eat or drink between breakfast and the study meal, 4 hours later. For the test meal they were brought to the eating laboratory where they participated in a lunch meal modeled after social phobia assessments^{24–25,21}. The lunch meal consisted 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 to eat an appropriate lunch and press the bell when they were done. 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.

Psychological assessment—Clinical severity was assessed at baseline by the Yale Brown Cornell Eating Disorder Severity Scale (YBC-EDS),²⁶ a semi-structured interview. Baseline anxiety was measured by the Spielberger State-Trait Anxiety Inventory (STAI),²⁷ Trait version. Eating related anxiety was measured by the STAI, state version (STAI-S) immediately prior to each laboratory meal.

Treatment acceptability—After treatment assignment, patients were asked to rate the study treatment for appropriateness and likelihood of success on a Likert scale from 1–10. Treatments were re-rated after study completion.

Statistical Methods

The primary outcome measure was the change in caloric intake at test meals before and after study treatment. Change in intake was selected as the outcome measure because it is a more efficient measure than covariance when the correlation between pre-and post-treatment intake is high.²⁸ The secondary outcome measure was the pre-meal STAI-S for each individual. A two-sample Student's t-test was used to compare treatment groups. Sensitivity analyses were conducted using Wilcoxon rank sum test (a nonparametric test). Secondary regression analyses were conducted using change in intake as outcome and baseline anxiety (pre-meal STAI-S) and treatment indicator as predictors. Association between improvement in anxiety and improvement in intake was assessed by Spearman's ρ , a non-parametric correlation measure, to protect against potential outliers. Clinical characteristics were compared by two-sample t-test. Tests are two-sided and statistical significance was set at $p=0.05$.

RESULTS

Recruitment and Sample Characteristics

Of the 58 patients admitted during the study period, 32 were randomized and 30 individuals completed the study. Figure 1 displays the flow of patients through admission, eligibility assessment, randomization, and study completion. Data from two individuals (1 AN-EXRP, 1 CRT) are not included in analyses as one withdrew before participating in the baseline test meal, and the other withdrew after two treatment sessions and completed only the baseline meal. Therefore, data are from 30 individuals with AN, 15 per group.

Patient demographic and clinical characteristics are presented in Table 1.

Outcome

Eating Behavior—The average test meal caloric intake of participants who received AN-EXRP increased from 352 ± 263 kcal at baseline to 401 ± 215 kcal post-treatment, while that of participants who received CRT decreased from 501 ± 232 kcal at baseline to 424 ± 221 kcal post-treatment. The change in intake between treatment groups ($+49 \pm 140$ vs. -77 ± 134 kcal)

is statistically significant ($t(28)=2.5$, 95% CI: 27.1, 223.8; $p=0.02$, Cohen's $d=0.92$; Wilcoxon rank sum test $p=0.04$) (Figure 2). When adjusting for AN subtype in a regression analysis, the group difference remains significant ($t(27)=2.207$, 95% CI: 13.4, 226.5; $p=0.04$), and there is no significant effect of AN subtype on the change in intake ($p=0.77$).

Test meal intake at baseline is a significant predictor of test meal intake post-treatment ($r=0.81$, CI: 0.64, 0.91, $p<.0001$), suggesting significant individual variability in laboratory eating behavior. Intake at baseline also significantly predicts change in intake ($r=-0.58$, CI: -0.10 , -0.84 , $p=0.002$), so that change in consumption in the post-treatment meal is inversely related to the size of the baseline meal.

Anxiety—Among those who received AN-EXRP, pre-meal STAIS decreased from a mean of 58 ± 15 at baseline to 51 ± 16 after treatment, compared with 51 ± 11 to 48 ± 10 in the CRT group; these changes are not statistically significantly different ($t(28)=0.94$, 95% CI: -4.0 , 11.5 ; $p=0.36$, Cohen's $d=0.34$). Change in anxiety (calculated as improvement in anxiety) is significantly associated with change in test meal intake (Spearman's $\rho=0.40$, $p=0.03$, 95% CI $0.05-0.69$). Within the AN-EXRP group, this association is significant (Spearman's $\rho=0.53$, $p=0.04$, 95% CI: $0.0-0.89$), but not in the CRT group ($\rho=0.29$, $p=0.30$, 95% CI: $-0.28-0.66$).

Secondary analyses of anxiety using regression models indicated that baseline pre-meal anxiety (STAIS) is not associated with the change in intake. After adjusting for baseline pre-meal STAIS; there is still a significant effect of treatment on change in test meal intake ($\beta=-113.6$, 95% CI: -221.0 , -6.29 ; $p=.04$).

Treatment satisfaction—Groups did not differ in ratings of appropriateness of treatment ($t(28)=0.82$, $p=0.42$) or likelihood of success of treatment ($t(28)=-0.43$, $p=0.67$) at randomization) or after treatment (appropriateness $t(23)=1.5$, $p=0.14$; success $t(23)=0.16$, $p=0.88$).

Discussion

This small randomized controlled trial tested the utility of directly addressing food-related anxiety using exposure and response prevention techniques to improve food intake in AN. Those randomized to AN-EXRP had significantly better change in food intake in a test meal than the control group. Although the groups did not differ in change in anxiety symptoms, decreases in anxiety did correlate with increased intake. The average intake of the AN-EXRP group increased by approximately 50 kcal, whereas the intake of the CRT group decreased by 77 kcal. Previous studies have documented that food intake rapidly declines after individuals leave the structured inpatient setting,²⁹ and the change in the CRT group may reflect the beginning of this phenomenon. AN-EXRP may serve to support continuation of healthy behaviors. Previous studies from our group have documented that eating behavior in AN is impressively resistant to change and is critically related to longer term outcome.¹³ The current demonstration that a brief, focused intervention affects eating behavior at a critical juncture in treatment suggests a potential utility of treatment focusing on anxiety and eating behavior.

The importance of addressing avoided foods has been described in the cognitive behavior therapy (CBT) for bulimia nervosa³⁰ and anorexia nervosa.³¹ AN-EXRP formalizes this approach using specific techniques. AN-EXRP sessions emphasize the importance of intensifying and experiencing eating-related anxiety rather than avoiding it, and may involve maneuvers to highlight such anxiety (e.g. a session might incorporate holding a greasy food for a prolonged amount of time). These techniques allow the therapist (in collaboration with

the patient) to enhance eating related anxiety and provide prolonged exposure to the situation such that the patient learns experientially that anxiety dissipates. Importantly, in AN-ERP exposures are conducted hierarchically. While CBT and behavioral programs often incorporate “food challenges” in which patients are encouraged to add foods to their diet, few treatment programs structure meals to ensure that foods are presented in accord with the individual’s hierarchy,³² and the emphasis has not been on the experience of anxiety. AN-EXRP also emphasizes cessation of ritualistic behavior during and related to eating, and follows the model of OCD treatment such that when ritualistic behaviors do occur, patients are taught methods to act immediately to reinstate the anxiety, in order to practice the experience of anxiety dissipating on its own. For example, when body checking occurs, the patient then shifts position to exaggerate body awareness.

Several study limitations merit consideration. First, the AN-EXRP intervention was delivered as an adjunct to intensive treatment and therefore the effects, including the remarkably low drop-out rate, cannot necessarily be extrapolated to less intensive treatment settings. Also, in this environment, patients assigned to different treatment arms regularly interact with each other such that they are not fully isolated from either the education about anxiety that is a key component of the AN-EXRP intervention or the elements of CRT. To the degree to which such “contamination” may have occurred, it would have reduced the magnitude of the differences in outcome between the two interventions. Interactive effects are not examined in this small study. We elected to standardize treatments on the basis of number of sessions, so that a difference in total therapy time was unavoidable as AN-EXRP sessions are inherently longer to allow for habituation and dissipation of anxiety. Formal ratings of palatability of the study meal were not obtained or compared between groups. Furthermore, the therapists may have had a significant bias favoring AN-EXRP, as this treatment was developed by the investigators of this study.

Finally, the randomization procedure failed to evenly distribute the subtypes of AN, such that the CRT group contained more AN, binge purge subtype. All of the participants were successfully engaged in treatment, and none was actively binge eating or purging at the time of the study. Furthermore, the statistical analyses suggest that subtype did not impact the findings (though the small sample size may have been underpowered to detect such an effect).

This study has important strengths. First, we selected a comparison condition that allows for evaluation of AN-EXRP against treatment as usual, controlling for the experience of participating in an additional experimental treatment. CRT is a credible treatment that has been utilized in inpatient care. The fact that the interventions were viewed as equally compelling by the patients supports the rigor of the comparison. Second, our outcome primary outcome – caloric intake in a laboratory setting – is an objective measurement that does not rely on patient self-report. This is particularly helpful in a study such as the current one in which treatment assignment cannot be blinded. The high retention rate (86% of eligible individuals completed the trial) is an additional strength.^{33–34}

In summary, these data suggest that a new approach that targets eating behavior directly – using in-session behavioral interventions and emphasizing the relationship between anxiety and intake – is capable of altering eating behavior in a severely ill population of individuals with AN. While the amount of change observed in this small study is modest, these data support further investigation of interventions using the techniques of AN-EXRP and evaluation of its use in other structured treatment settings.

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Figure 1. CONSORT Diagram

Figure 2. Change in test meal caloric intake in the Exposure and Response Prevention for AN (AN-EXRP) and Cognitive Remediation Therapy (CRT) groups

Change in caloric intake was measured as intake in a laboratory meal at Week 4 – Week 0 for each individual. The figure shows mean change per group; bars represent 95% confidence intervals.

Table 1

Baseline Clinical and Demographic Characteristics of Individuals with Anorexia Nervosa

	AN-EXRP (n=15)		CRT (n=15)		All Patients (n=30)		Chi Square	p
	N	%	N	%	N	%		
Gender								
Female	15	100	13	87	28	93	2.14	0.14
Male	0	0	2	13	2	7		
Subtype								
Restricting	12	80	7	47	19	63	3.59	0.06
Binge-purge	3	20	8	53	11	37		
							Mann Whitney U	p
Receiving psychotropic medication *	6	40	3	20	9	30	90	0.24
Current axis I diagnosis								
Anxiety disorder **	3	20	4	27	7	23	105	0.67
Depression	2	13	0	0	2	7	97.5	0.15
Lifetime axis I diagnosis								
Anxiety disorder	3	20	1	6	4	13	97.5	0.29
Depressive disorder	3	20	3	30	6	20	--	--
Prior substance abuse	4	27	5	33	9	30	105	0.78
	Mean	SD	Mean	SD	Mean	SD	t(1)	p
Age (yrs)	26.5	8.8	29.1	7.8	28	8	-0.85	0.40
Duration of Illness (yrs)	9.5	10.1	10.5	6.3	10	8	-0.33	0.75
Admission BMI (kg/m ²)	16.5	1.6	15.9	1.7	16.2	1.6	0.9	0.37
Pre-Treatment BMI (kg/m ²)	19.1	0.6	19.2	0.5	19.1	0.6	-0.62	0.54
Post-treatment BMI (kg/m ²)	20.2	0.7	20.4	0.8	20.3	0.8	-0.72	0.37
YBC-EDS, total	17.9	7.4	18.4	5.5	11.7	8.7	-0.20	0.85
STAI-T	58.3	11.9	60.9	6.9	54.5	13.4	-0.75	0.46

* Medications were antidepressants(n=8) and a second generation antipsychotic (n=1) for sleep.

** Anxiety disorder diagnoses were social phobia, generalized anxiety disorder, post traumatic stress disorder, and stable obsessive compulsive disorder(n=1) that had been previously treated.