ORIGINAL ARTICLE

Randomized Clinical Trial Comparing Family-Based Treatment With Adolescent-Focused Individual Therapy for Adolescents With Anorexia Nervosa

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Context: Evidence-based treatment trials for adolescents with anorexia nervosa are few.

Objective: To evaluate the relative efficacy of family-based treatment (FBT) and adolescent-focused individual therapy (AFT) for adolescents with anorexia nervosa in full remission.

Design: Randomized controlled trial.

Setting: Stanford University and The University of Chicago (April 2005 until March 2009).

Participants: One hundred twenty-one participants, aged 12 through 18 years, with *DSM-IV* diagnosis of anorexia nervosa excluding the amenorrhea requirement.

Intervention: Twenty-four outpatient hours of treatment over 12 months of FBT or AFT. Participants were assessed at baseline, end of treatment (EOT), and 6 months' and 12 months' follow-up posttreatment.

Main Outcome Measures: Full remission from anorexia nervosa defined as normal weight (≥95% of expected for sex, age, and height) and mean global Eating Disorder Examination score within 1 SD of published means. Secondary outcome measures included partial remission rates (>85% of expected weight for height plus those who were in full remission) and changes in body mass index percentile and eating-related psychopathology.

Results: There were no differences in full remission between treatments at EOT. However, at both the 6- and 12-month follow-up, FBT was significantly superior to AFT on this measure. Family-based treatment was significantly superior for partial remission at EOT but not at follow-up. In addition, body mass index percentile at EOT was significantly superior for FBT, but this effect was not found at follow-up. Participants in FBT also had greater changes in Eating Disorder Examination score at EOT than those in AFT, but there were no differences at follow-up.

Conclusion: Although both treatments led to considerable improvement and were similarly effective in producing full remission at EOT, FBT was more effective in facilitating full remission at both follow-up points.

Trial Registration: clinicaltrials.gov Identifier: NCT00149786.

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ANOREXIA NERVOSA (AN), with an incidence rate of 73.9 per 100 000 and a prevalence among adolescent girls of 0.48% to 0.70%, is a serious disorder affecting both psychological and physical health.[1-4] Physical health impacts in adolescents include growth retardation, pubertal delay or interruption, and peak bone mass reduction.[5] The aggregate mortality rate of AN is approximately 5.6% per decade,[6,7] with about half of the deaths due to cardiac failure and half, suicide. Common comorbid psychological conditions are depressive disorders; anxiety disorders, including obsessive-compulsive disorder; and personality disorders.[8-12]

Although various forms of individual and family therapy are used in the treatment of adolescents with AN, most have not been systematically examined.[13] Hence, there is little guidance for providing evidence-based interventions for either adolescents or adults with AN.[13] For adolescents with AN, there are only 6 randomized clinical trials published to date.[14-19] One model of a commonly used psychological approach, adolescent-focused individual therapy (AFT), is a psychodynamically informed individual psychotherapy focusing on enhancing autonomy, self-efficacy, individuation, and assertiveness while also including collateral parent meetings to support individual treatment.[17,20] This model was examined in 1 modest clinical trial that suggested that the approach was likely effective.[17] Another approach is a family-based treatment (FBT) that promotes parental control of weight restoration while

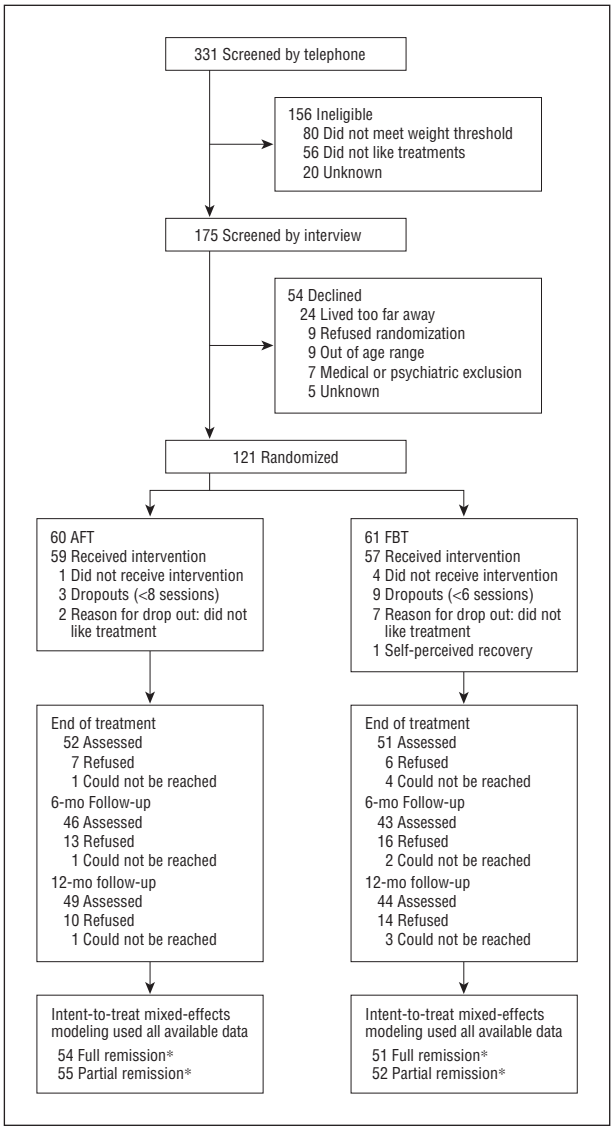

Figure 1. Consolidated Standards of Reporting Trials diagram. AFT indicates adolescent-focused individual therapy; FBT, family-based treatment. *Full remission requires both Eating Disorder Examination score and body mass index while partial remission only requires body mass index; thus, sample sizes differ because a few participants did not provide Eating Disorder Examination score.

enhancing familial functioning as it relates to adolescent development.[15,16,19,21-24] Two small studies suggest that FBT may be more efficacious than individually based therapy.[14,17]

The purpose of the current study was to conduct a randomized clinical trial comparing these 2 outpatient psychosocial treatments for adolescents with AN. We hypothesized that FBT, by empowering parents to directly address the behaviors maintaining weight loss in their children, would be more effective than the individually based psychological approach (AFT) in normalizing weight and psychological processes associated with AN. Our primary outcome was full remission from AN defined as having achieved an ideal body weight (IBW) of 95% or greater expected for sex, age, and height[25] and an Eating Disorder Examination (EDE) global score within 1 SD of community norms.[26] Secondary outcomes were rates of partial remission (all participants with weights >85% IBW expected for height, sex, and age), changes in body mass index (BMI) percentage adjusted for age and sex, and changes in EDE score.

METHODS

DESIGN

This 2-site study (The University of Chicago and Stanford University) randomized 121 participants to either FBT or AFT. Randomization was performed separately for each site by a biostatistician in the Data and Coordinating Center under independent management from either intervention site. The Efron biased coin design was used to balance treatment within sites. Participants were stratified within sites based on current use of psychiatric medication.[27] Participants were assigned to therapists who conducted both forms of treatment to control for nonspecific therapist effects. Therapists were 5 PhD psychologists and 2 child psychiatrists, all with previous experience treating eating disorders. Three 2-day workshops were held to train therapists in manualized FBT and AFT. The first workshop was held prior to beginning recruitment; the second, 6 months after the first participants were randomized; and the third workshop was held 1 year later. Experts, who are also authors of this report (J.L. and D.L.G. for FBT, and A.M. for AFT), trained the therapists and supervised them weekly. Therapists treated 3 pilot cases satisfactorily with each treatment prior to treating randomized cases. This study protocol was approved by the institutional review boards at the respective sites. Treatment took place in clinics for child and adolescent eating disorders located at each university.

PARTICIPANTS

Participants were recruited from October 2004 through March 2007 by advertising to clinicians, organizations, and clinics treating eating disorders. After telephone screening (N=331) to determine eligibility, 175 (53%) were invited for an assessment interview (**Figure 1**). The study was described in detail to participants and parents and consent was obtained (assent for adolescents younger than 18 years of age) before assessments were conducted. Participants were eligible if they were between the ages of 12 and 18 years, were living with their parents or legal guardians, and met the *DSM-IV* criteria for AN excluding the amenorrhea criterion.[28,29] Weight thresholds (IBW<86%) for study entry were calculated using the Centers for Disease Control and Prevention weight charts, growth curve trajectories, and Metropolitan Life charts.[25,30] Participants meeting the binge eating and purging subtype and adolescents taking a stable dose of antidepressant or anxiolytic medications for a period of 2 months who still met entry criteria were eligible. Participants were excluded from the study if there was a current psychotic disorder, dependence on drugs or alcohol, physical condition known to influence eating or weight (eg, diabetes mellitus, pregnancy), or previous treatment with FBT or AFT. Seven potential participants were excluded for medical or psychiatric reasons. Both adolescent participants and their families were required to be available for the 1-year treatment duration. Sixty-nine percent (121) of eligible participants agreed to randomization.

TREATMENTS

Family-Based Treatment

Family-based treatment was a 3-phase treatment.[31] In the first phase, therapy was characterized by attempts to absolve the parents from the responsibility of causing the disorder and by com-

plimenting them on the positive aspects of their parenting. Families were encouraged to work out for themselves how best to help restore the weight of their child with AN. In phase 2, parents were helped to transition eating and weight control back to the adolescent in an age-appropriate manner. The third phase focused on establishing a healthy adolescent relationship with the parents. Twenty-four 1-hour sessions were provided over the 1-year period.

Adolescent-Focused Therapy

Adolescent-focused therapy (originally described by Robin et al[17] as Ego-Oriented Individual Therapy) posits that individuals with AN manifest ego deficits and confuse self-control with biological needs.[20] Patients learn to identify and define their emotions and, later, to tolerate affective states rather than numbing themselves with starvation. In phase 1, the therapist established rapport, assessed motivation, and formulated the patient's psychological concerns. The therapist actively encouraged the patient to stop dieting and to gain weight by setting weight goals and emphasizing the need to change these behaviors. The importance of weight gain was discussed and actively encouraged throughout treatment until the patient was weight restored. The therapist interpreted behavior, emotions, and motives and helped the patient distinguish emotional states from bodily needs and asked the patient to accept responsibility for food-related issues as opposed to relinquishing authority to others (eg, parents). Phase 2 focused on encouraging separation and individuation and increasing the ability to tolerate negative affect. Phase 3 focused on termination. Adolescent-focused therapy sessions were 45 minutes for a total of 32 sessions over the treatment year (24 contact hours). Collateral meetings were held with parents alone to assess parental functioning, advocate for the patient's developmental needs, and update parents on progress. Up to 8 sessions were used for this purpose.

ASSESSMENT AND PROCEDURES

Assessment included diagnostic evaluation for comorbid psychiatric disorders, weight, and eating disorder–related symptoms and psychopathology. There were 4 assessment points: pretreatment, end of treatment (EOT), and 6- and 12-month follow-up. Independent assessors not involved in treatment delivery conducted all assessments.

MEASURES

An a priori definition of full remission used in this study is the proportion of participants who achieved a combination of a minimum of 95% of expected IBW for sex, age, and height as determined by Centers for Disease Control and Prevention growth charts[25] (http://www.cdc.gov/growthcharts/percentile_data_files.htm) and scores within 1 SD from global mean EDE published norms (1.59).[26,32,33] Normalization of weight in this range approximates the typical set point for menstrual return in most females, the weight where growth is likely to resume, and the weight where bone loss may begin to be reversed.[34-37] The normalization of the global EDE score to 1 SD of community norms sets the risk related to eating and weight concerns to community averages.[38] Partial remission rates included all participants who achieved a weight more than 85% of expected IBW for age, height, and sex and therefore also includes those who achieved full remission as well as those with weight 95% or greater IBW but with elevated EDE scores. This definition of partial remission is similar to "intermediate outcome" using Morgan-Russell criteria and is reported herein to allow comparison with other studies of adolescent AN.[14,16-18]

Eating Disorder Examination

The EDE[39] is a standardized, validated investigator-based interview that measures the severity of the characteristic psychopathology of eating disorders in adolescents, including the frequency of key behaviors and the severity of psychopathology.[40,41]

Weight

Weight and height were assessed before every therapy session in both treatment protocols. For all major assessments, the participant was weighed in a hospital gown on a balance-beam scale that was regularly recalibrated. The BMI (calculated as weight in kilograms divided by height in meters squared) percentiles, adjusted for age and sex, were used as the outcome measure (http://www.cdc.gov/growthcharts/percentile_data_files.htm).[42,43] Percentiles less than 10% are considered to be consistent with AN.[44] An average BMI percentile of 50 would be the expected average in a group of normally developing adolescents.

Schedule for Affective Disorders and Schizophrenia for School-Aged Children

The Schedule for Affective Disorders and Schizophrenia for School-Aged Children[45] (aged 6-18 years) is a widely used interview for detecting psychiatric disorders in children and adolescents. Both parents and adolescents were interviewed to achieve summary ratings.

PARTICIPANT SAFETY

Participants were assessed at approximately weekly intervals throughout the study by physicians with extensive experience in medical treatment of adolescents with AN. If a participant became medically unstable (hypothermic [body temperature $<36.3°C$], bradycardic [heart rate <50 beats/min or QT interval corrected for heart rate >0.45], orthostatic [pulse increase >35, systolic blood pressure decrease >10 mm Hg], or weight fell $<75\%$ IBW), hospitalization for medical stabilization was required according to the guidelines of the Society for Adolescent Medicine and the American Academy of Pediatrics.[46]

STATISTICAL ANALYSES

Statistical analysis for this study was performed by the Data and Coordinating Center. Sample size calculation was based on prior studies.[19] We calculated that a sample of 120 participants, 60 per site, 30 per site in each treatment group, and using a 5% 2-tailed test would yield 84% power to detect a moderate main effect (Cohen *d* of 0.5). The primary outcome analysis was based on the intent-to-treat principle and used the definitions of full remission and partial remission described earlier.

For the analyses of repeated measures, we used a method widely known as mixed-effects modeling or growth modeling.[47-50] We used maximum likelihood estimation implemented in Mplus, which is a widely used program for statistical modeling with latent variables.[51] The mixed-effects analyses were conducted including all data from individuals in the sample (Figure 1). Full remission or partial remission (0=no; 1=yes) at 3 assessment points (0, 6, and 12 months) were used as repeated measures in the analyses. We treated these repeated measures as categorical in the analyses and allowed for nonlinear trend across the 3 assessment points. As predictors of longitudinal trends of remission, we used treatment assignment status (FBT=0.5; AFT=−0.5), site (site 1=0.5; site 2=−0.5), treatment × site interaction, and the baseline EDE score (centered at the mean to

Table 1. Demographics and Baseline Clinical Characteristics

	No. (%)					
	Chicago		Stanford		Total	
	AFT	FBT	AFT	FBT	AFT	FBT
Age, y, mean (SD)[a]	14.7 (1.6)	14.4 (1.8)	14.8 (1.4)	13.8 (1.6)	14.7 (1.5)	14.1 (1.7)
Comorbidity	9 (31)	4 (12)	10 (32)	8 (28)	32	20
Depression disorders	5	4	5	6	10	10
Anxiety disorders	2	2	2	2	4	4
OCD	2	0	2	1	4	1
ADHD	1	0	0	1	1	1
PTSD	1	0	1	0	2	0
Phobia	0	0	0	0	0	0
Tic	0	0	0	1	0	1
Adjustment disorder	0	0	1	0	1	0
Duration of illness, mo, mean (SD)	8.9 (7.8)	11.6 (8.5)	11.6 (9.5)	13.0 (8.6)	10.3 (8.7)	12.3 (8.5)
Ethnicity						
Asian	0	1 (3)	6 (19)	6 (21)	6 (10)	7 (12)
Black	0	0	1 (3)	0	1 (2)	0
White	27 (93)	27 (84)	20 (64)	18 (62)	47 (78)	45 (74)
Hispanic	1 (3)	3 (9)	2 (6)	3 (10)	3 (5)	6 (10)
Other	1 (3)	1 (3)	2 (6)	2 (7)	3 (5)	3 (5)
Minority[b]	2 (7)	5 (16)	11 (35)	11 (38)	13 (22)	16 (26)
Male	3 (10)	4 (12)	1 (3)	3 (10)	4 (7)	7 (11)
Intact family[c]	23 (79)	30 (94)	23 (74)	19 (66)	46 (77)	49 (80)
Medication use[d]	9 (31)	8 (25)	2 (6)	1 (3)	11 (18)	9 (15)
Parental education, y, mean (SD)[e]	17.8 (2.6)	16.3 (2.6)	16.1 (3.3)	17.1 (2.6)	17.0 (3.1)	16.7 (2.6)
Previous hospitalizations[f]	7 (24)	6 (19)	22 (71)	19 (66)	29 (48)	25 (41)
BMI percentile for age and sex	5.3 (7.6)	7.7 (9.2)	5.0 (7.6)	6.8 (5.5)	5.2 (7.55)	7.2 (7.6)
Global EDE score[g]	2.0 (1.6)	1.7 (1.2)	2.1 (1.5)	1.3 (1.4)	2.1 (1.5)	1.5 (1.3)
Sample size	29	32	31	29	60	61

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; AFT, adolescent-focused individual therapy; BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); Chicago, The University of Chicago; EDE, Eating Disorder Examination; FBT, family-based treatment; OCD, obsessive-compulsive disorder; PTSD, posttraumatic stress disorder; Stanford, Stanford University.

[a] Treatment: $F_{1,117}=4.6$; $P=.04$.
[b] Center: $F_{1,117}=11.4$; $P=.001$.
[c] Center: $F_{1,117}=5.1$; $P=.03$.
[d] Center: $F_{1,117}=12.5$; $P=.001$.
[e] Center × treatment: $F_{1,117}=6.1$; $P=.02$.
[f] Center: $F_{1,117}=33.5$; $P<.001$.
[g] Treatment: $F_{1,117}=10.1$; $P=.03$.

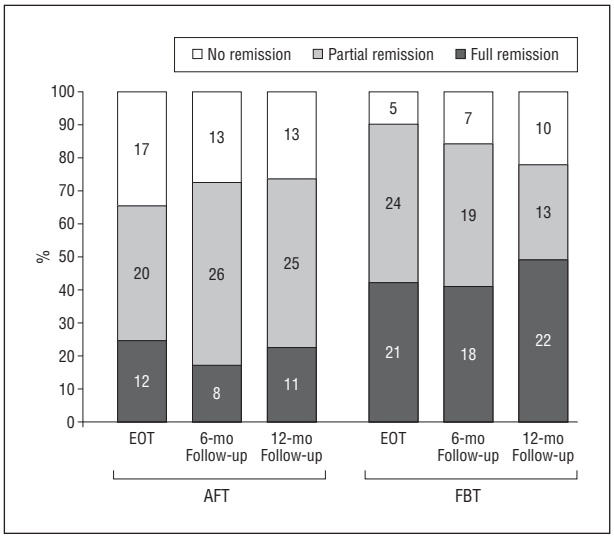

Figure 2. Observed partial and full remission rates by treatment assignment (end of treatment [EOT]: adolescent-focused individual therapy [AFT], n=49; family-based treatment [FBT], n=50; 6-month follow-up: AFT, n=47; FBT, n=44; and 12-month follow-up: AFT, n=49; FBT, n=45).

control for baseline differences on this variable as indicated on **Table 1**). Based on mixed-effect model estimates, the difference between FBT and AFT conditions in terms of the remission status at each follow-up point was calculated. This method was chosen instead of reporting the overall rate of change given that there was no variation at baseline (ie, nobody was in remission). Longitudinal trends of full and partial remission rates, based on the observed means, are shown in **Figure 2**.

Analysis of continuous outcomes (BMI age- and sex-adjusted percentiles and global EDE score) used a similar approach: mixed modeling was used to estimate the treatment differences at each point using treatment, site, and the interaction as predictors and controlling for the baseline values.

Treatment and site differences for participant characteristics, dropout status, and assessment completion were calculated using a 2-way analysis of variance with site, treatment, and their interaction as independent measures. Nonparametric measures, such as number of minutes of therapy and number of days of hospitalization, were compared using the Mann-Whitney *U* statistic. Logistic regression, reported as a Wald (W) statistic, was used to analyze differences in assessment and hospitalization rates for the 2 centers and treatments.

Effect size in this study is reported as number needed to treat (NNT). The NNT is defined as the number of patients one would

Table 2. Change in Outcome Over Time Based on Mixed-Effects Model Estimates

Measure	Baseline-Adjusted Estimated Mean (SE), %		Baseline-Adjusted Mean Difference FBT–AFT (95% CI), %	Test of Significance (t Value[a])	P Value	NNT Effect Size
	AFT	FBT				
Full remission[b]						
End of treatment	22.6 (5.7)	41.8 (6.7)	19.3 (–0.2 to 41.0)	t_{104}=1.9	.06	5
6-mo Follow-up	18.3 (5.2)	39.9 (7.0)	21.6 (1.6 to 44.7)	t_{104}=2.2	.03	5
12-mo Follow-up	23.2 (5.7)	49.3 (7.2)	26.2 (4.8 to 47.7)	t_{104}=2.5	.02	4
Partial remission[c]						
End of treatment	66.9 (7.4)	89.1 (9.3)	22.2 (3.9 to 30.3)	t_{106}=2.3	.02	5
6-mo Follow-up	73.7 (7.9)	82 (8.6)	8.3 (–9.5 to 19.2)	t_{106}=1.0	.32	12
12-mo Follow-up	75.3 (7.6)	77.7 (8.9)	2.3 (–16.3 to 14.9)	t_{106}=0.3	.78	43
BMI percentile for age and sex						
End of treatment	23.4 (2.8)	31.4 (2.8)	8.0 (0.1 to 15.9)	t_{117}=2.0	.048	5
6-mo Follow-up	29.1 (3.4)	31.4 (3.5)	2.3 (–7.4 to 12.0)	t_{117}=0.5	.64	19
12-mo Follow-up	29.0 (3.4)	32.2 (3.4)	3.2 (–6.4 to 12.8)	t_{117}=0.7	.51	14
EDE score						
End of treatment	1.20 (0.15)	0.71 (0.16)	–0.49 (–0.93 to –0.06)	t_{117}=–2.2	.03	4
6-mo Follow-up	1.01 (0.16)	0.78 (0.17)	–0.24 (–0.70 to 0.22)	t_{117}=–1.0	.31	10
12-mo Follow-up	1.04 (0.16)	0.79 (0.16)	–0.25 (–0.69 to 0.19)	t_{117}=1.1	.26	9

Abbreviations: AFT, adolescent-focused individual therapy; BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); CI, confidence interval; EDE, Eating Disorder Examination; FBT, family-based treatment; NNT, number needed to treat.

[a] The t values reported are calculated by dividing the mixed-effects model estimates by estimated standard errors (both based on maximum likelihood estimation). Corresponding P values can be obtained from the standard t distribution critical value table.

[b] Only those who achieved 95% ideal body weight, adjusted for age, sex, and height, and total EDE score within 1 SD of normal.

[c] More than 85% ideal body weight adjusted for age, sex, and height (includes those who achieved full remission).

expect to treat with 1 treatment to have 1 more success than if they had all been treated with the other treatment. Equivalent treatments result in an NNT of 1. The larger the NNT, the less effective the treatment is in comparison. Kraemer et al[52] report NNT values of 8 to 9 as small, 3 to 6 as medium, and 2 to 3 as large, in correspondence to the cut points referenced by Cohen for effect size.[53] For categorical variables, NNT is the reciprocal of the percentage of difference between groups. For continuous measures, NNT is calculated according to standard formulas.[52,54]

RESULTS

PARTICIPANT CHARACTERISTICS

Participants were mean (SD) 14.4 (1.6) years of age with a mean IBW of 82% and mean (SD) BMI of 16.1 (1.1) using Centers for Disease Control and Prevention growth charts. The majority of the sample was female (91%) with a mean (SD) duration of illness of 11.3 (8.6) months. Twenty-six percent (n=31) of the participants reported a current comorbid psychiatric disorder by the Schedule for Affective Disorders and Schizophrenia for School-Aged Children and 17% (n=20) were taking psychotropic medications at baseline. Seventy-nine percent (n=95) were from intact families. Twenty-four percent of the participants were ethnic minorities (self-reported). Forty-five percent (n=54) had been hospitalized for AN or medical problems associated with AN prior to randomization (Table 1).

RANDOMIZATION

There were few differences between treatment groups on baseline sociodemographic variables; however, the global EDE score was significantly higher in AFT (**Table 2**) and participants in FBT were slightly younger than those in AFT. Site differences included significantly more ethnic minorities at Stanford University; higher rates of baseline medication use at The University of Chicago; higher rates of intact families at The University of Chicago; and higher rates of previous hospitalization at Stanford University.

TREATMENT DELIVERY AND STUDY RETENTION

Treatment time did not differ between groups. Participants assigned to FBT completed 84% of total therapy time compared with 92% for AFT. We used treatment time rather than number of sessions in this analysis because sessions were not equal in duration in both treatments (60-minute sessions for FBT and 45-minute sessions in AFT). The Spearman correlation between treatment time in each group and full remission was not significant. Study dropout (failure to complete study assessment) was 14% at EOT and 22% at follow-up (Figure 1). There was a significant difference in assessment follow-up rates between the 2 intervention sites at all points (EOT, W_1=4.0; P=.046; 6-month follow-up, W_1=10.6; P=.001; 12-month follow-up, W_1=7.9; P=.005), with 1 site completing 68% and the other 89% of planned assessments.

HOSPITALIZATION DURING THE TREATMENT PHASE

More participants were hospitalized in AFT (n=32; 37%) than FBT (n=9; 15%) (W_1=1.4; P=.02). For those hospitalized, the median number of days until first hospitalization was 17 days for AFT and 32 days for FBT, but there was not a significant difference between the groups. Fifty-nine percent (13 of 22) of AFT and 44% (4 of 9) of FBT hospitalizations were in the first 4 weeks of treatment. Stan-

ford University had higher hospitalization rates than The University of Chicago (43% compared with 8%; $W_1 = 13.1$; $P < .001$). The median number of days in the hospital was 10 for AFT participants and 12 for FBT participants, and weight gain while in the hospital was a median of 1.7 kg for AFT participants and 1.0 kg for FBT participants. Three hospitalizations were related to suicidal thoughts or behavior and the remainder were for medical stabilization.

OUTCOMES

Based on mixed-effects analysis estimates, full remission rates between treatments (Figure 2 and Table 2) did not differ statistically at EOT (FBT = 42%; AFT = 23%; $P = .055$; NNT = 5); however, at the 6-month follow-up (FBT = 40%; AFT = 18%; $P = .03$; NNT = 5) and 12-month follow-up (FBT = 49%; AFT = 23%; $P = .02$; NNT = 4), FBT was statistically superior to AFT. Rates of partial remission (Figure 2 and Table 2) were greater in FBT than AFT at EOT (FBT = 89%; AFT = 67%; $P = .02$; NNT = 5) but did not differ at follow-up.

Treatment effects on age- and sex-adjusted BMI percentile were greater in FBT than AFT (mean difference = 8.0; 95% confidence interval, 0.1 to 15.9; $P = .048$; NNT = 5) at EOT but not at follow-up. Treatment effects on EDE score were greater in FBT than AFT (mean difference = –0.49; 95% confidence interval, –0.93 to –0.06; $P = .03$; NNT = 4) at EOT but not at follow-up (Table 2).

Of the 33 subjects who achieved full remission at EOT, 29 (10 AFT subjects, 19 FBT subjects) were also assessed at the 12-month follow-up. Six of the 29 had relapsed 1 year after EOT: 2 (10%) from FBT and 4 (40%) from AFT. Of the 77 subjects who achieved partial remission at EOT, 71 (31 AFT subjects and 40 FBT subjects) were available for assessment at the 12-month follow-up. Nine of the 71 had relapsed by the 12-month follow-up: 7 (18%) from FBT and 2 (6%) from AFT. Relapse rates cannot be detected in Figure 2 because the numbers and percentages reported at follow-up points are totals that include subjects newly in remission as well as those who remained in remission from EOT.

There were no significant site × treatment interaction effects on the primary or secondary outcomes.

During the follow-up period, 50 subjects (29 AFT subjects, 21 FBT subjects) received additional therapy in the community. In AFT, 29 subjects (57%) received individual therapy, 9 subjects (18%) received family therapy, and 9 (18%) had emergency department–related hospitalizations. In FBT, 18 subjects (38%) received individual therapy, 8 (17%) received family therapy, and 4 (8%) were hospitalized for an emergency department–related condition. There were no significant differences between the 2 treatments.

COMMENT

Among the strengths of this study were the relatively large sample size, use of manualized treatments, and therapists trained in both approaches through workshops and supervision by experts.[20,31] Assessments were conducted independent of treatment and used well-characterized measures. Treatment attrition and study dropout were relatively low. In addition, we used growth curve modeling in our analyses to avoid the restrictive assumptions of repeated-measures analysis and to make use of all available data without listwise deletion of data. This also allowed us to avoid parameter biases inherent in last observation carried forward methods.[55,56] We used clinically meaningful thresholds for full and partial remission. In addition, we used age- and sex-adjusted BMI percentiles appropriate for analyzing weight outcomes in this age group.[42]

Both treatments led to considerable improvements with no difference on the primary outcome variable, full remission, at EOT, though the moderate NNT (5) suggests that the failure to detect a statistical superiority for FBT may have been due to limited power. There were also no differences between the 2 groups on treatment dropout, average amount of treatment received, or use of treatment after EOT. During the follow-up period, however, FBT became statistically superior to AFT. This may have been due in part to differences in relapse from full remission, 10% for FBT and 40% for AFT, as well as more subjects reaching full-remission thresholds in FBT. Weight gain appeared faster for FBT as assessed by age- and sex-adjusted BMI percentile, though this effect was no longer found at follow-up. Participants in FBT were also hospitalized significantly less often.

The results of this study can be compared with the 2 previous studies comparing FBT with individually based therapies. The first study[14] is best understood as a relapse prevention trial because all participants in the adolescent cohort comparable with those in our study (n = 21) were treated in the hospital to approximately 90% IBW prior to receiving either FBT or individual therapy.[14] Initially, both groups of patients lost considerable weight; however, those who received FBT did not lose as much and regained weight faster and to a greater degree than those in individual therapy. At the end of 1 year of outpatient treatment, the mean IBW of the group assigned to FBT was 92.8% (±8) while the individual therapy group had a mean IBW of 80.1% (±15). Sixty percent of the adolescents who received FBT were in the "good" Morgan-Russell outcome group that requires weight to 85% IBW, menstruation, and psychological improvement[57] (similar to our full remission group) while 90% were in either the "good" or "intermediate" group (similar to the partial remission group used herein) at EOT. For those participants assigned to individual therapy, 10% were in the Morgan-Russell good outcome group and 20% were in the Morgan-Russell intermediate group by percentage of IBW. The individual treatment used by Russell and colleagues[14] was supportive in nature and not specifically tailored to adolescents. This may account for the better performance of AFT in our study.

In a study of 37 adolescents with AN, Robin[58] compared a family therapy similar to FBT (Behavioral Family Systems Therapy) with a more adolescent-focused individual therapy (Ego-Oriented Individual Therapy) similar to AFT.[17] The current study's findings are consistent with those in Robin et al.[17] Behavioral Family Systems Therapy was found to be superior in promoting weight gain and menstrual return both at EOT and at follow-up.

A small majority (52.6%) of those in family therapy and 41.2% of participants in individual therapy achieved the 50th percentile BMI (the outcome closest to full remission used herein) at EOT. At 1-year follow-up, the percentage that reached this threshold was 66.7% in family therapy and 46.7% in Ego-Oriented Individual Therapy. In this moderately scaled study, significant differences were not found for any of these categorical outcomes.

Although FBT outperformed AFT on several important clinically significant measures in the current study, AFT "caught up" in terms of age- and sex-adjusted BMI percentile and global EDE scores during the follow-up period. From a clinical perspective, there are cases where parents are unwilling or unable to participate in FBT where AFT would likely be a good alternative. Further, there are few providers who practice FBT and dissemination of this treatment remains a challenge in nonspecialized treatment settings. Although AFT is primarily an individually based therapy, it involves parent meetings without the child to support the goals of the individual sessions as would be usual in most child or adolescent psychiatric treatment.[20,59]

Despite considerable improvements in many participants in the study, a substantial portion of participants remained clinically concerning either in terms of low weight or continued eating-related cognitions or both. Future studies should address how to improve outcomes for these groups. On the other hand, relapse, especially weight relapse, is a common problem in the treatment of AN[60-62]; therefore, one of the most important findings of this study is the low rate of relapse (10%) from full remission in FBT.[19]

Most of the limitations of the current study are those commonly found in randomized clinical trials of treatment. The sample size, though comparatively large for adolescent AN studies, remains modest. Participants were recruited from referrals to university-based treatment centers for child and adolescent eating disorders. Participants, though meeting diagnostic criteria by weight for AN, were not severely underweight at the start of treatment and may therefore differ from some community samples. Availability of expert medical consultation, medical surveillance of participants during treatment, medical hospitalization for participants with acute medical illness, and expectation effects of participation in a treatment study may also have contributed to outcome. The study was undertaken in research centers known for work in FBT and a possible bias because of this could have affected results despite efforts to limit this possibility through the study design and an independent data center. The study follow-up was limited to only 12 months posttreatment. A longer-term follow-up of the participants would determine if the effects of the treatment are maintained or if additional differences between them emerge over time.[14,17]

The findings of this study, together with the existing smaller-scale studies, suggest that FBT is superior to AFT for adolescent AN, though AFT remains an important alternative treatment for families that would prefer a largely individual treatment.[63] Additional studies are needed comparing FBT with other credible treatments, including cognitive behavioral treatment and other forms of family therapy, to delineate the best approach to treating adolescent AN.

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