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RESEARCH ARTICLE

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Efficacy of a partial hospital programme for adults with eating disorders

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Abstract

Partial hospital programmes (PHPs) have demonstrated efficacy in the treatment of eating disorders (EDs); however, few programmes have examined long-term outcomes across diagnoses, including subtypes of anorexia nervosa (AN). The present study examined the effectiveness of PHP for adult patients (n = 243) with AN-restricting subtype (n = 79), AN binge/purge subtype (n = 46), and bulimia nervosa (n = 118). These patients tended to have long-standing courses of illness (43%, illness duration >7 years) and high levels of psychiatric comorbidity (92.2%). Patients completed questionnaires at admission, discharge, and follow-up, M (SD) = 11.50 months (5.29). Through follow-up, all diagnoses demonstrated significant improvements in weight, ED psychopathology, and comorbid symptoms, with some exceptions for the AN binge/purge group. In exploratory analyses, 49% of patients met criteria for full or partial remission at discharge and 37% at follow-up. Results provide support for the effectiveness of PHP in improving ED outcomes in a severe sample through longer-term follow-up.

KEYWORDS

day treatment, eating disorders, outcome, partial hospital, treatment

1 | INTRODUCTION

Eating disorders (EDs), including anorexia nervosa (AN) and bulimia nervosa (BN), are serious psychiatric illnesses that frequently demonstrate a chronic course, severe medical complications, and increased risk for mortality (Arcelus, Mitchell, Wales, & Nielsen, 2011; Mehler, Winkelman, Andersen, & Gaudiani, 2010; Steinhausen, 2002). Data from reviews of randomized controlled trials (RCTs) of outpatient psychotherapy for adult AN show that less than half of patients achieved remission at end of treatment and long-term follow-up (see Galsworthy-Francis & Allan, 2014; Watson & Bulik, 2013). Although RCTs in BN adults have demonstrated more consistent improvements, even with the most efficacious outpatient therapy treatments, only about 40% achieve remission at long-term follow-up (Brown & Keel, 2012). It is even more concerning that outside of clinical trials, the percentage of AN and BN patients able to achieve long-term remission through outpatient psychotherapy may be considerably lower. RCTs tend to have stringent inclusion/exclusion criteria, which may preclude participation by those with complex, severe ED histories, and multiple comorbidities. Therefore, although some patients achieve remission through weekly outpatient psychotherapy treatment, many do not respond to treatment, relapse following treatment, or continue to exhibit a long-standing course (Brown & Keel, 2012).

As such, higher levels of care are often necessary to facilitate recovery, especially for patients with a long-

standing duration of illness who have not responded to weekly outpatient treatment (Anderson et al., 2017). Partial hospital programmes (PHPs) are recommended for those whose symptoms are too severe to be treated by a traditional outpatient team, but who do not require hospitalization for medical stabilization or a residential setting for complete containment of behaviours. At the PHP level of care, patients receive 6–10 hr per day of group therapy and supervised meals 4–7 days per week. This structure has several advantages over other levels of care. First, compared with less intensive treatment approaches, supervision during and after most meals helps facilitate weight gain, resumption of normal eating patterns, and interruption of compensatory behaviours. Second, unlike in residential settings, patients spend nights and weekends away from the programme, allowing them to practice using the skills they are learning in a more natural and challenging environment (Zipfel et al., 2002). Third, and importantly, PHPs are typically more cost-effective than inpatient or residential programmes (Kaplan & Olmsted, 1997; von Wietersheim, Zeeck, & Kuchenhoff, 2005; Williamson, Thaw, & Varnado-Sullivan, 2001) and appear to produce equivalent outcomes through 3-year follow-up (Zeeck, Weber, Sandholz, Joos, & Hartmann, 2011).

Given the potential advantages of PHP treatment, research studies evaluating the effectiveness of symptom improvement are critical. Although RCTs are the "gold standard" and represent the most stringent test of treatment efficacy, evaluating the effectiveness of PHPs using a naturalistic design is also essential in order to assess outcomes that are more representative and generalizable for the majority of patients seeking ED treatment. However, this is challenging due to variability across studies in treatment approach and intensity, outcome measures, and definitions of remission (Friedman et al., 2016). Taking these challenges into account, a recent review of PHP outcome studies demonstrated that outcomes at discharge were generally very positive, with studies reporting significant improvements in body mass index (BMI), reductions in binge/purge frequency, and improvement in depression, anxiety, and ED pathology from treatment admission to discharge (Friedman et al., 2016). Improvements at time of discharge are not unexpected, because patients' discharge dates are determined, at least in part, on significant symptom improvements. Further, at higher levels of care, treatment providers have the ability to monitor and support meal plan adherence, weight gain, and cessation of ED behaviours during programme.

Although most patients have improved by discharge, the enduring, relapsing nature of EDs necessitates assessing patients for months, or years, after discharge to determine the lasting effectiveness of the programme (Friedman et al., 2016). Unfortunately, few PHP studies have collected outcomes data at follow-up. Friedman et al. (2016) found that out of the 10 adult treatment outcome studies evaluating PHP programmes between 2001 and 2015, only five collected follow-up data, and the follow-up interval ranged from 3 to 18 months. Fittig, Jacobi, Backmund, Gerlinghoff, and Wittchen (2008) had the largest sample size in this literature, with 283 patients, and a follow-up retention rate of 43% at 18 months. Investigators classified 40% of both AN and BN patients as remitted at follow-up. Notably, however, patients were excluded if they met criteria for a substance use disorder or had suicidal thoughts or behaviours, which may have biased the sample to those with less severe comorbidities.

The Fittig et al. (2008) study was the only one large enough to separate outcomes for AN subtypes, which is essential given research demonstrating different outcomes and associated features for AN-restricting (AN-R) and AN binge/purge (AN-BP) diagnoses (Steinhausen, 2002). Of the remaining studies, one examined only AN patients (Abbate-Daga et al., 2015), one examined only BN patients (Zeeck, Herzog, & Hartmann, 2004), and three examined mixed samples of AN and BN patients (Fittig et al., 2008; Jones, Bamford, Ford, & Schreiber-Kounine, 2007; Willinge, Touyz, & Thornton, 2010). Follow-up outcomes for PHPs have generally demonstrated improvements in BMI and ED cognitions for both AN and BN (Abbate-Daga et al., 2015; Fittig et al., 2008; Willinge et al., 2010) and continuous measures of bulimic symptoms for BN (Fittig et al., 2008). However, studies examining binge/purge behaviours or continuous measures of bulimic symptoms in AN have not found significant improvements from admission to follow-up (Abbate-Daga et al., 2015; Fittig et al., 2008). The rates of remission for AN patients at 12- to 18-month follow-up have ranged from 14.6% to 51.4% (Abbate-Daga et al., 2015; Fittig et al., 2008), with lower rates of remission for AN-BP (29.0%; Fittig et al., 2008). For BN patients, 40.4–50% achieved remission at 18-month follow-up (Fittig et al., 2008; Willinge et al., 2010). Regarding mood and anxiety symptoms, many studies have demonstrated significant improvements through follow-up (Abbate-Daga et al., 2015; Willinge et al., 2010), whereas others have had less promising or more mixed results (Fittig et al., 2008).

Thus, PHP outcome studies have not examined large samples of both BN and AN patients (including both subtypes) with severe comorbidities through longer term follow-up. Therefore, the present study sought to examine treatment outcomes at follow-up for the largest sample of PHP patients to date, using a naturalistic design. Our hypotheses were as follows: (a) Participants would demonstrate significant decreases in ED symptoms across all diagnoses from admission through follow-up,

(b) depression and anxiety symptoms would significantly decrease from admission through follow-up, and (c) remission rates would be comparable to those in previous studies.

2 | MATERIALS AND METHOD

2.1 | Participants and procedure

Data for the present study came from 243 adult patients diagnosed with AN or BN who were admitted to the University of California San Diego (UCSD) PHP between January 2010 and August 2016 and completed study surveys. Patients were referred to the programme from primary care providers, psychiatrists, and therapists in the community or from a higher level of care, including hospital and inpatient and residential treatment facilities. Criteria for admission to PHP conformed to the American Psychiatric Association's medical, psychiatric, and behavioural criteria guidelines (Yager et al., 2014). If patients were medically unstable at the time of assessment, they were referred to a higher level of care. No other exclusion criteria were applied to the current study sample. For patients who had multiple admissions, data from their most recent admission to programme were used. Participants met the 2010 draft criteria for the *Diagnostic and Statistical Manual of Mental Disorders—Fifth Edition* (American Psychiatric Association, 2013) AN, BN, or subthreshold AN or BN. Diagnoses were made by one of three staff psychiatrists using a semistructured interview. A total of 125 patients were diagnosed with an AN-spectrum disorder (79 AN-R and 46 AN-BP), and 118 were diagnosed with a BN-spectrum disorder.

The study utilized a naturalistic design and participants who consented into the study completed self-report surveys online at admission, discharge, and various lengths of follow-up (3 months, 6 months, 1 year, and 2 years). For many patients, data were collected at multiple follow-up time points, and the longest follow-up survey data point was used for each participant. Participants were compensated with a gift card (initially $10, which was later changed to $50 to increase retention) for completing discharge and follow-up surveys. All study procedures were approved by the UCSD Institutional Review Board.

2.2 | Programme description

The UCSD Eating Disorders PHP (hereinafter referred to as "the programme") includes individual, family, and group therapy, provided up to 6 days a week, for 6–10 hr per day, depending on illness severity. Upon admission to PHP, the majority of patients begin attending 10 hr per day for 6 days a week. The programme is heavily based in dialectical behaviour therapy (DBT) and offers "full-package DBT," which includes skills coaching, weekly 2-hr DBT skills groups, weekly individual therapy, and weekly DBT consultation team meetings to ensure that therapists are adhering to the model and receiving support to improve their effectiveness. In addition to DBT skills groups, patients attend other therapy groups that reinforce and/or supplement DBT concepts. Individual sessions include diary card review, chain analyses of behaviours highest on the DBT hierarchy, and utilization of commitment strategies. Skills coaching (via phone or text messaging) is offered outside of programme hours to assist with skills generalization, with a particular focus on using skills to prevent ED and other maladaptive behaviours.

The programme includes up to three supervised meals and two snacks per day and weekly sessions with a psychiatrist and dietitian. Patients who are significantly underweight relative to their estimated ideal body weight (as determined by the programme's dieticians based on review of weight history) are placed on a weight restoration diet (goal of approximately 1- to 2-lb gain per week). Weight progress is assessed weekly, and dietary plans are adjusted to help restore weight as needed. In addition to traditional DBT skills training group content described above, patients also take part in a variety of evidence-based groups including applied DBT or supplementary DBT skills groups (interpersonal effectiveness, emotion regulation, distress tolerance, and mindfulness), Radical Openness DBT (an "offshoot" of DBT for patients characterized by emotional overcontrol; Lynch et al., 2013), Cognitive Behavioural Therapy—Enhanced (CBT-E; Fairburn et al., 2009), CBT for anxiety, Acceptance and Commitment Therapy (Manlick, Cochran, & Koon, 2013), process groups, motivation, expressive arts, nutrition, and goal setting (see Table S1 for sample day schedule). All patients are medically monitored with vital signs taken 3 times per week and labs/studies ordered as needed, overseen by nursing staff, psychiatrists, primary care providers, and dietitians.

Patients step down from PHP to the intensive outpatient programme (IOP) before being discharged to an outpatient team. IOP is 4 hr per day from 3 to 5 days per week and emphasizes vocational planning, independent meal preparation, and relapse prevention. The average length of stay in programme, including time in both PHP and IOP, was 89.24 days ($SD = 63.31$) and did not differ across diagnoses (see Table 1).

2.3 | Measures

2.3.1 | Body mass index

Height and weight measured at admission and weight measured at discharge were used to calculate BMI

TABLE 1 Admission demographics across diagnoses

	AN-R ($n = 79$)	AN-BP ($n = 46$)	BN ($n = 118$)		
	M (*SD*)/*n* (%)	*M* (*SD*)/*n* (%)	*M* (*SD*)/*n* (%)	F/χ^2	*p*
Age	24.13 (9.11)[a]	26.51 (9.67)[ab]	28.19 (9.99)[b]	4.18	.02
BMI	17.44 (1.98)[a]	18.65 (1.46)[a]	24.26 (4.62)[b]	103.76	<.001
BMI < 18.5	59 (74.7%)	22 (47.8%)	--	9.19	.002
Length of illness	6.48 (9.55)[a]	11.27 (9.55)[b]	10.20 (9.11)[b]	5.03	.007
Patients with length of illness >7 years	21 (26.9%)	28 (62.2%)	57 (51.8%)	17.70	<.001
Years of education	14.15 (2.33)[a]	14.96 (2.74)[ab]	14.95 (2.24)[b]	3.00	.05
Gender	6 (7.6%)	2 (4.3%)	5 (4.2%)	1.11	.58
Length of stay	97.26 (61.06)	95.43 (69.89)	81.46 (61.69)	1.76	.18
Comorbid disorder at admission					
Mood disorder	48 (60.8%)	39 (86.7%)	102 (86.4%)	19.54	<.001
Anxiety disorder	59 (76.6%)	38 (82.6%)	86 (74.1%)	1.32	.52
Alcohol use disorder	1 (1.3%)	5 (11.1%)	12 (10.9%)	8.71	.01
Substance use disorder	2 (2.6%)	4 (8.9%)	11 (9.6%)	4.39	.11
Any comorbid disorder	68 (86.1%)	45 (97.8%)	111 (94.0%)	6.80	.03
Medications at admission					
Antidepressant	58 (73.4%)	40 (87.0%)	92 (78.0%)	3.13	.21
Atypical antipsychotic	23 (29.1%)	17 (37.0%)	25 (21.2%)	4.54	.10
Mood stabilizer	9 (11.4%)	15 (32.6%)	42 (35.6%)	14.86	.001
Anxiolytic	6 (7.6%)	4 (8.7%)	11 (9.3%)	.18	.91

Note. Superscripts of differing value (a, b) indicate significant differences between groups at $p < .05$. -- = not applicable; AN-R = anorexia nervosa-restricting subtype; AN-BP = anorexia nervosa binge/purge subtype; BN = bulimia nervosa; BMI = body mass index.

(kg/m^2) at these two time points. BMI at follow-up was calculated from self-reported weight. Objective BMI and BMI derived from self-reported weight were strongly correlated at baseline, $r(289) = .98$, $p < .001$, and discharge, $r(188) = .94$, $p < .001$, in the present sample, supporting the use of self-reported weight at follow-up.

2.3.2 | Eating Disorder Examination Questionnaire

The Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994) is a 31-item self-report questionnaire used to evaluate the presence and severity of eating pathology during the previous 28 days. Shape and Weight Concern subscales were combined based on research demonstrating that these subscales load onto the same factor (Peterson et al., 2007). Self-induced vomiting and laxative misuse were summed to create a composite purging frequency variable (Gideon et al., 2016). Internal consistency for all subscales was strong across time points (Restraint subscale, $\alpha = .87–.88$; Eating Concern subscale, $\alpha = .81–.89$; Shape and Weight Concern subscales, $\alpha = .96$; Total score, $\alpha = .96–.97$).

2.3.3 | Beck Depression Inventory

The Beck Depression Inventory (Beck, Steer, & Brown, 1996) is a 21-item self-report questionnaire used to evaluate the severity of depressive symptoms. Internal consistency within the present sample was excellent ($\alpha = .92–.95$).

2.3.4 | State–Trait Anxiety Inventory—Trait subscale

The State–Trait Anxiety Inventory—Trait subscale (STAI-T; Spielberger, Gorsuch, & Lushene, 1970) is a 20-item self-report measure that assesses trait anxiety. Internal consistency for the STAI-T subscale ranged from $\alpha = .89$ to .94.

2.3.5 | Remission criteria

Criteria for remission and partial remission for exploratory analyses were based on the rigorous criteria developed and empirically tested by Bardone-Cone et al. (2010). In the present study, full remission was defined

as (a) weight > 18.5 BMI; (b) no fasting, bingeing, or purging in the last 28 days as reported on the EDE-Q, and (c) EDE-Q Global scores within 1 SD of community means (Mond, Hay, Rodgers, & Owen, 2006). Partial remission was defined as (a) weight > 18.5 BMI; (b) no fasting, bingeing, or purging in the last 28 days as reported on the EDE-Q, and (c) EDE-Q Global scores greater than 1 SD outside of community means.

2.4 | Statistical analysis

To reduce potential bias associated with completer-only samples, analyses were run as intent-to-treat (ITT) with all participants who provided baseline data, including those who dropped out of treatment, being included in analyses. Descriptive analyses were run using Statistical Package for the Social Sciences (version 23). Linear mixed-effects models examined intervention effects across diagnosis on ED-related and secondary outcomes using the Rstudio lme4 package (Bates, Maechler, Bolker, & Walker, 2015). Full information maximum likelihood was used to account for missing data (Schafer & Graham, 2002). As binge eating and purging frequency variables were zero inflated, analyses were conducted in the subset of participants who reported binge eating or purging at admission. Repeated measurements of the dependent variable nested within participants were included at Level 1. Diagnostic group (AN-R, AN-BP, and BN; referent = AN-R) and the interaction between diagnosis and time were modelled at Level 2. Time was modelled as a factor, which allowed flexibility in modelling non-linear effects and variation in time between assessment points. Diagnosis by time interactions were modelled as the difference in slope from intake and discharge (Diagnosis × Time 2) and intake and follow-up (Diagnosis × Time 3) across diagnosis. Length of stay, age, and age of onset were included as covariates in all models. Additional information on model fitting is provided within the Supporting Information. To control for multiple comparisons across the EDE-Q subscales, the family-wise error rate was set at $p = .01$. For post hoc analyses, Tukey's procedure was used to correct for pairwise comparisons. To assess clinically meaningful change, reliable change index scores were calculated (Jacobson & Truax, 1991) and are presented as the percentage of patients achieving clinically meaningful change.

3 | RESULTS

3.1 | Patient demographics

Table 1 presents demographic data across diagnoses. The average age of the sample was 26.6 years (SD = 9. 8; range = 17–60). AN-R patients were younger and had fewer years of education than BN participants, and AN-R patients also had shorter length of illness compared with AN-BP and BN patients. Across AN subtypes, approximately 40% of patients demonstrated a length of illness longer than 7 years, consistent with characterizations of severe and enduring AN (Touyz et al., 2013). A greater proportion of patients with AN-R compared with AN-BP were under a BMI of 18.5 at admission. There were no significant differences in the racial, $\chi^2(8) = 10.59$, $p = .23$, or ethnic, $\chi^2(2) = .05$, $p = .98$, composition of the sample between diagnoses (74.7% Caucasian, 5.4% Asian, 1.2% African American, 0.4% Native American/Alaskan Native, and 18.3% Other; 21.0% of the sample identified as Hispanic). Comorbid diagnoses and medications at admission for the full sample are presented in Table 1. Mood and anxiety disorders were the most common comorbidities across diagnoses, and the majority of patients were on antidepressant medication at admission.

3.2 | Patient retention and predictors of loss to follow-up

Participation rates for the discharge and follow-up assessments were 59.3% (n = 144 [AN-R = 55; AN-BP = 26; BN = 63]) and 52.7% (n = 128 [AN-R = 48; AN-BP = 26; BN = 54]), respectively. Reasons for discharge from treatment were as follows: in accordance with clinical recommendations (n = 138; 60.5%); against clinical advice (n = 57; 25.0%); insurance (n = 17; 7.5%); returned to school/home out of state (n = 6; 2.6%); transferred to a higher level of care (n = 6; 2.6%); and failed contract/therapeutic discharge (n = 4; 1.8%). On average, follow-up took place at 11.50 months (SD = 5.29 months, range = 2.60–28.33 months). The breakdown of patients across duration of follow-up was as follows: 3 months (n = 7; 5.5%), 6 months (n = 33; 25.8%), 1 year (n = 68; 53.1%), and 2 years (n = 20; 15.6%). Given that data at discharge from PHP are often subject to bias and do not accurately reflect long-term patient outcomes (Friedman et al., 2016), results primarily focus on outcomes at follow-up.

There were no significant differences at admission between patients lost to follow-up and those who completed follow-up assessments in age, diagnosis, ED symptoms, anxiety or depression, education, and race or ethnicity (all p values, NS); however, patients who did not complete follow-up assessments had shorter length of stay in the programme, $F(1, 241) = 10.06$, $p = .002$, and were more likely to have discharged against clinical advice (dropout rate against clinical advice:

59.6%, in accordance with clinical recommendations: 39.1%; $\chi^2(1) = 6.86$, $p = .009$).

3.3 | ITT outcome results

3.3.1 | Primary ED outcomes by diagnosis across discharge and follow-up

Body mass index

For individuals diagnosed with AN-spectrum disorder, analyses revealed main effects of time across discharge and follow-up (see Table 3), such that overall, AN-spectrum patients gained weight from admission to discharge and maintained these gains through follow-up (see Table 3). Both AN-spectrum subtypes demonstrated large effect size increases in BMI through follow-up (see Table 3). Analyses were also run for the subset of patients in the full sample with BMI below 18.5 at admission, and the pattern of results was comparable. At follow-up, 80.5% of AN-spectrum patients maintained a BMI above 18.5.

3.3.2 | Binge eating and purging behaviours

For individuals diagnosed with AN-BP-spectrum and BN-spectrum disorders, analyses revealed a main effect of time, such that overall, binge eating and purging decreased from both admission to discharge and admission to follow-up (see Table 3). Older patients and those with shorter length of stay had higher binge frequencies. Post hoc comparisons revealed that the BN group, but not the AN-BP group, demonstrated significant reductions in binge eating and purging through follow-up (see Table 3). Although the AN-BP group did not demonstrate statistically significant improvements, demonstrating the clinical relevance of these results, 75% of AN-BP-spectrum and 43.8% of BN-spectrum patients were binge eating abstinent at follow-up. Results were comparable for purging behaviours, with 66.7% of AN-BP-spectrum and 47.8% of BN-spectrum patients purge abstinent at follow-up.

3.3.3 | ED symptomatology

Regarding the EDE-Q Global, Restraint, and Eating Concern scores, analyses revealed significant effects of time across discharge and follow-up (see Table 2), with all diagnoses demonstrating significant improvements through follow-up (see Table 3). Regarding clinical significance, Global scores across all diagnoses at discharge and follow-up fell within 1 SD of the mean of a community sample of women, M (SD) = 1.52 (1.25) (Mond et al., 2006). Similarly, Restraint scores across all diagnoses at discharge and follow-up fell within 1 SD of the mean of a community sample, M (SD) = 1.30 (1.40) (Mond et al., 2006). For Eating Concern, mean scores for the AN-

TABLE 2 Estimates from multilevel models comparing diagnoses over time

			Binge eating		Purge		EDE-Q		EDE-Q		EDE-Q		EDE-Q	
	BMI		Frequency		Frequency		Global		Restraint		Eating		Shape/Weight	
Predictor	Est.	*p*	Est.	*p*	Est.	*p*	Est.	*p*	Est.	*p*	Est.	*p*	Est.	*p*
Intercept	17.49	<.001	7.18	.003	25.41	.001	2.90	<.001	1.92	<.001	2.41	<.001	3.49	<.001
AN-BP	1.24	.004	-	-	-	-	1.02	<.001	1.19	<.001	.86	.002	.92	.001
BN	-	-	4.57	.003	1.99	.70	1.25	<.001	.79	.001	.99	<.001	1.57	<.001
Time 2 (intake–discharge)	3.00	<.001	−8.23	<.001	−16.52	.02	−1.22	<.001	−1.54	<.001	−1.51	<.001	−.90	<.001
Time 3 (intake–follow-up)	2.75	<.001	−6.43	.006	−16.82	.02	−.96	<.001	−1.22	<.001	−1.20	<.001	−.79	.003
LOS	.00	.66	−.03	.001	−.01	.60	.00	.81	.00	.32	.00	.90	.00	.95
Age	.00	.81	.24	<.001	.06	.75	.00	.99	.01	.39	.01	.36	−.01	.54
Age of onset	.01	.79	−.05	.68	−.21	.58	.01	.68	.02	.45	.01	.60		.95
AN-BP × Time 2	−1.26	.02	-	-	-	-	−.18	.63	−.50	.23	−.32	.39	−.20	.89
BN × Time 2	-	-	−3.43	.15	−2.44	.77	−.34	.25	−.33	.32	−.26	.37	−.59	.18
AN-BP × Time 3	.03	.96	-	-	-	-	−.40	.31	−.88	.05	−.33	.40	−.70	.53
BN × Time 3	-	-	−3.33	.20	−2.35	.79	−.89	.004	−.49	.16	−.61	.05	−1.42	<.001

Note. Referent group is AN-R (anorexia nervosa-restricting subtype). BMI analyses were conducted in AN groups only, and binge eating and purging analyses were conducted in AN-BP and BN groups only, indicated by a dash. AN-BP = anorexia nervosa binge/purge subtype; BMI = body mass index; BN = bulimia nervosa; EDE-Q Eating = Eating Disorder Examination Questionnaire—Eating Concerns subscale; EDE-Q Restraint = Eating Disorder Examination Questionnaire—Restraint subscale; EDE-Q Shape/Weight = Eating Disorder Examination Questionnaire—Shape and Weight Concern subscale composite; EDE-Q Global = Eating Disorder Examination Questionnaire—Global score; LOS = length of stay.

TABLE 3 Outcome measures at admit, discharge, and follow-up across diagnosis

	Admit	(Admit to) Discharge				(Admit to) Follow-up			
Variable	*M* (*SE*)	*M* (*SE*)	*p*	Effect size (Cohen's *d*)	% RCI	*M* (*SE*)	*p*	Effect size (Cohen's *d*)	% RCI
BMI									
AN-R	17.41 (0.25)	20.42 (0.29)	<.001	1.38	-	20.18 (0.32)	<.001	1.25	-
AN-BP	18.66 (0.34)	20.41 (0.44)	.003	.77	-	21.45 (0.46)	<.001	1.20	-
Binge eating frequency									
AN-BP	10.45 (1.32)	2.22 (1.78)	<.001	.91	-	4.02 (2.08)	.07	.66	-
BN	15.02 (0.73)	3.36 (0.98)	<.001	1.48	-	5.25 (1.07)	<.001	1.24	-
Purging frequency									
AN-BP	22.40 (4.30)	5.88 (5.43)	.16	.58	-	5.59 (5.74)	.18	.58	-
BN	24.39 (2.81)	5.43 (3.76)	.001	.63	-	5.23 (4.01)	.002	.64	-
EDE-Q Global score									
AN-R	3.05 (0.17)	1.83 (0.20)	<.001	.81	47.3	2.09 (0.21)	<.001	.65	42.7
AN-BP	4.07 (0.23)	2.67 (0.29)	<.001	.92	57.7	2.71 (0.30)	.001	.88	46.2
BN	4.30 (0.15)	2.74 (0.19)	<.001	.99	50.8	2.45 (0.20)	<.001	1.19	63.0
EDE-Q Restraint									
AN-R	2.53 (0.19)	0.99 (0.22)	<.001	.93	34.5	1.31 (0.23)	<.001	.74	29.2
AN-BP	3.71 (0.25)	1.67 (0.32)	<.001	1.23	57.7	1.62 (0.34)	<.001	1.21	46.2
BN	3.32 (0.16)	1.45 (0.20)	<.001	1.12	41.3	1.61 (0.22)	<.001	1.02	42.6
EDE-Q Eating									
AN-R	2.76 (0.16)	1.25 (0.19)	<.001	1.07	49.1	1.56 (0.21)	<.001	.83	41.7
AN-BP	3.62 (0.22)	1.79 (0.28)	<.001	1.25	61.5	2.09 (0.30)	<.001	1.01	42.3
BN	3.74 (0.14)	1.97 (0.18)	<.001	.79	44.4	1.94 (0.20)	<.001	.85	50.0
EDE-Q Shape/Weight									
AN-R	3.35 (0.19)	2.41 (0.22)	.004	.57	38.2	2.60 (0.24)	.08	.45	33.3
AN-BP	4.40 (0.25)	3.40 (0.32)	.09	.60	38.5	3.37 (0.34)	.11	.60	42.3
BN	4.91 (0.16)	3.52 (0.21)	<.001	.82	39.7	2.96 (0.23)	<.001	1.14	63.0
BDI									
AN-R	22.34 (1.44)	12.32 (1.71)	<.001	.79	60.0	15.59 (1.80)	.02	.53	52.1
AN-BP	29.42 (1.89)	18.26 (2.49)	.001	.87	65.4	22.76 (2.40)	.20	.53	50.0
BN	26.39 (1.23)	16.55 (1.62)	<.001	.75	47.6	15.67 (1.71)	<.001	.83	51.9
STAI Trait									
AN-R	52.45 (1.28)	43.87 (1.86)	<.001	.58	61.8	45.99 (1.59)	.01	.58	47.9
AN-BP	58.21 (1.68)	48.24 (2.63)	.01	.63	69.2	51.78 (2.19)	.16	.57	46.2
BN	56.04 (1.09)	47.59 (1.57)	<.001	.81	50.8	45.51 (1.54)	<.001	.90	53.7

Note. All means are presented untransformed. All *p* values reflect analyses using transformed variables and use Tukey correction. RCI analyses were not conducted for BMI and frequency count measures, indicated by a dash. % RCI = Percentage of people who made clinically meaningful change according to reliable change index; BDI = Beck Depression Inventory; BMI = body mass index; EDE-Q Eating = Eating Disorder Examination Questionnaire—Eating Concerns subscale; EDE-Q Restraint = Eating Disorder Examination Questionnaire—Restraint subscale; EDE-Q Shape/Weight = Eating Disorder Examination Questionnaire—Shape and Weight Concern subscale composite; EDE-Q Global = Eating Disorder Examination Questionnaire—Global score; STAI Trait = State–Trait Anxiety Inventory—Trait subscale.

spectrum groups at discharge and follow-up fell within 1 SD of community norms for the Eating Concern subscale, whereas the BN-spectrum group fell just above this cut-off, *M* (*SD*) = 0.76 (1.06) (Mond et al., 2006). Across EDE-Q Global, Restraint, and Eating Concern scores, the percentage of patients that made a clinically

meaningful change from admission to follow-up ranged from 29% to 63% across diagnoses (see Table 3).

The model for the EDE-Q Shape/Weight Concern subscale revealed significant effects of time across discharge and follow-up and significant main effects of AN-BP-spectrum and BN-spectrum diagnoses (see Table 2). Both AN-R-spectrum and BN-spectrum groups demonstrated significant decreases in shape/weight concerns from admission to discharge; however, these effects were only maintained in the BN-spectrum group (see Table 3). There were no significant decreases over time in shape/weight concerns in the AN-BP group. Notably, the percentage of patients that made a clinically meaningful change from admission to follow-up ranged from 33% to 63% across diagnoses.

3.3.4 | Secondary outcomes by diagnosis over time

For both depressive symptoms and trait anxiety, analyses revealed significant effects of time at discharge and follow-up. All diagnoses demonstrated significant decreases in depressive and anxiety symptoms over time, with the exception of the AN-BP-spectrum group, which did not maintain these improvements at follow-up (see Tables 2, 3 and S3). Importantly, regarding depression scores, the mean scores at admission across diagnoses fell within the moderate to severe range, and scores at discharge and follow-up fell below the mild range for the AN-R-spectrum and BN-spectrum groups. Further, 50–52% of patients had clinically meaningful improvements in Beck Depression Inventory scores, and 46–54% achieved significant improvement in STAI-T scores from admission to follow-up (see Table 2).

3.4 | Exploratory analyses: Remission rates across diagnoses over time

Tables S2 presents exploratory analyses examining remission rates across discharge and follow-up by diagnosis. Remission rates increased when there were no requirements for meeting cognitive criteria for recovery. Remission rates were lower for diagnoses involving bingeing and purging symptoms.

Averaging across diagnoses, 40.3% of patients met criteria for full remission (normal BMI, no behaviours, and normal cognitions) at discharge (AN-R = 64.7%; AN-BP = 24.1%; BN = 29.3%) and 30.8% of patients met criteria for full remission at follow-up (AN-R = 36.8%; AN-BP = 27.3%; BN = 27.3%). Across diagnoses, combining both full and partial remission rates, 48.5% of patients met full or partial criteria at discharge (AN-R = 74.5%; AN-BP = 40.0%; BN = 29.3%) and 36.5% of patients at follow-up (AN-R = 47.4%; AN-BP = 36.4%; BN = 27.3%). Full or partial remission rates of the subset of patients with illness duration >7 years were generally comparable to the full sample (see Table S2).

4 | DISCUSSION

The present study sought to examine treatment outcomes for patients diagnosed with AN-spectrum and BN-spectrum diagnoses in PHP using a naturalistic design. Importantly, the remission rates for AN-R, AN-BP, and BN were generally maintained from discharge to follow-up and comparable for patients meeting criteria for severe and enduring AN. Results from ITT analyses support the efficacy of PHP across all primary outcomes variables (BMI, binge/purge frequency, and EDE-Q scores) from intake to discharge and across follow-up for AN-R and BN patients. Notably, 80.5% of AN-spectrum patients maintained a healthy BMI at follow-up. Patients with AN-BP also had improvements on most of these variables at discharge; although, likely due to reduced statistical power, they did not maintain significant improvements on binge eating at follow-up and did not significantly improve purging and weight/shape concerns at discharge. All diagnoses demonstrated significant improvements at discharge on secondary depression and anxiety measures, and patients with AN-R and BN maintained these improvements at follow-up.

Overall, results support the effectiveness of PHP in reducing ED symptoms and improving outcomes from patient admission to follow-up. Importantly, the present sample reflects adults with an average illness duration of 6–11 years, with a majority of the AN-BP patients and a substantial minority of the AN-R patients meeting criteria for severe and enduring AN (Hay, Touyz, & Sud, 2012; Touyz et al., 2013). The clinical improvements within the present study are notable, as severe and enduring AN patients have one of the highest mortality rates, often display a chronic course, and typically respond poorly to treatment (Hay et al., 2012; Steinhausen, 2002). Similarly, the BN patients within the present study also represent a severe group, with an average illness duration of over 10 years and approximately 20% meeting criteria for a substance use disorder, both of which have been demonstrated to be poor prognostic factors for BN (Keel, Mitchell, Miller, Davis, & Crow, 1999). Despite the severity of the present sample, effect sizes across primary and secondary outcomes were within the medium to large range, which is consistent with previous established PHP outcome studies in AN or BN (Abbate-Daga et al., 2015; Crino & Djokvucic, 2010; Exterkate, Vriesendorp, & de Jong, 2009; Fittig et al., 2008; Willinge et al., 2010; Zeeck et al., 2004). Further,

results demonstrating clinically meaningful reductions in symptoms for a substantial proportion of patients across BMI and ED psychopathology are encouraging.

Improvements in depression and anxiety symptoms were also generally consistent with previous PHP research (see Friedman et al., 2016), and the majority of patients demonstrated clinically meaningful reductions in depression at follow-up. Notably, we did find improvements in trait anxiety, suggesting that this is a malleable construct; however, anxiety levels still remained elevated across follow-up. These results are consistent with research demonstrating that problems with anxiety represent potential vulnerabilities that generally predate ED onset and persist after recovery (Kaye, Bulik, Thornton, Barbarich, & Masters, 2004). Results may also reflect the high rates of comorbidities within the present sample.

Although comparison of remission rates is difficult due to varying definitions across studies, exploratory analyses within the present study used strict remission criteria including maintaining a normal weight, absence of all behaviours, and normative scores of eating pathology (Bardone-Cone et al., 2010). Follow-up remission rates across diagnoses from the present study (full remission = 30.8% and full or partial remission = 36.5%) were similar to those from Fittig et al. (2008), who used comparable remission criteria for treatment completers (41%). Importantly, the participants within the present study may represent a more severe group of patients, given that Fittig et al. (2008) excluded those who were suicidal or had a substance use diagnosis. Within the present study, remission rates were comparable between the full sample and the subsample with duration of illness greater than 7 years. These results are encouraging, given that patients with more long-standing illness duration tend to be more treatment-refractory. One possible reason for these effects may be the programme's focus on DBT, a comprehensive treatment specifically designed to increase motivation and target various comorbidities; however, further research on this topic is needed.

Within the present study, the AN-BP group appeared to be the most treatment-resistant. Importantly, the duration of illness for this group was on average over 11 years, highlighting the severe and enduring nature of the sample. Patients with AN-BP did not demonstrate statistically significant improvements in purging symptoms at discharge and did not maintain improvements in binge eating at follow-up. Given the generally comparable effect sizes for AN-BP compared with BN on purging frequency, nonsignificant results may merely reflect reduced power in the AN-BP group. Consistent with this, approximately 66–75% of the AN-BP sample was binge or purge abstinent at follow-up. However, our results are consistent with lack of statistically significant results for AN-BP on continuous measures of bulimic symptoms in previous studies (Abbate-Daga et al., 2015; Fittig et al., 2008) and research demonstrating the negative prognostic impact of binge eating/purging and AN-BP diagnosis on the course and outcome of AN (Steinhausen, 2002; Zipfel et al., 2002; Zipfel, Lowe, Reas, Deter, & Herzog, 2000). Further, weight and shape concerns did not improve in AN-BP patients and were not maintained at follow-up for AN-R patients. These results are in line with research demonstrating that weight and shape concerns are frequently resistant to treatment, often the last symptoms to remit, and typically increase in response to weight gain in AN (Bamford, Attoe, Mountford, Morgan, & Sly, 2014; Eshkevari, Rieger, Longo, Haggard, & Treasure, 2014). Results also imply that adjunctive interventions to improve weight and shape concerns for PHP patients with EDs, particularly AN, are needed (Bhatnagar, Wisniewski, Solomon, & Heinberg, 2013). Importantly, results within the diagnostic confirmed subsample support significant and large improvements through follow-up on all measures in the AN-BP group.

Importantly, there is no standard definition of PHP treatment. The UCSD PHP programme incorporates all elements of adherent standard DBT, and thus, we consider our programme to be DBT oriented. However, the programme also incorporates additional elements from other theoretical orientations (e.g., CBT and Acceptance and Commitment Therapy) and more general elements common within higher levels of care (e.g., supervised meals and snacks and medication management). This makes it challenging to disentangle which elements or mechanisms of the treatment programme are responsible for symptom improvements, including disentangling the effect of psychosocial and pharmacological treatments. Further, although research on the efficacy of DBT for EDs in outpatient care has shown promise (Chen et al., 2017; Chen, Matthews, Allen, Kuo, & Linehan, 2008; Safer, Robinson, & Jo, 2010; Safer, Telch, & Agras, 2001), large-scale RCTs are still needed. Thus, although it is our clinical experience that DBT is effective in improving ED symptoms, this is not possible to definitively demonstrate using a naturalistic design.

The current study has several important strengths including a large sample size, the use of measures with solid psychometric properties, sophisticated data modelling techniques, and the use of maximum likelihood for handling missing data. Further, the naturalistic design of the current study increases the external validity and generalizability of these results compared with RCTs. There are also several limitations to consider. First, the mixed duration of follow-up length limits conclusions regarding results at one specific point in time. Further, the study sample consisted of predominantly self-report measures, which may limit the validity of the patient responses.

Notably, average BMI at admission for AN patients was within the mild range, which may have favoured clinical response in these groups, given a lesser state of malnutrition. Additionally, data on medications prescribed over the course of treatment were not available. Another important limitation is that the EDE-Q assesses ED symptoms over the past 28 days, which does not provide a sensitive picture of potential improvement around a patient's discharge date (e.g., a patient could purge 5 times total in the last 28 days but no times in the last 2 weeks prior to discharge). Further, diagnoses were determined by psychiatrist interview, for which reliability has not been previously established and personality disorder diagnoses (e.g., borderline personality disorder) were not formally assessed. Future studies within DBT-based programmes for EDs should examine borderline personality disorder diagnoses as a potential treatment moderator. Additionally, although our overall sample was relatively large, we were underpowered to detect medium effects for the AN-BP group. Patients were predominantly female, which reduces the generalizability of these findings for male patients, a group that is largely underrepresented in ED outcome studies.

The most notable confound and limitation was that only 53% of patients were retained at follow-up, indicating possible selection bias and highlighting concerns regarding reliability. Unfortunately, this is not an uncommon problem. Across previous adult PHP outcomes studies, the weighted mean for retention rates at follow-up was 50.0% (range, 43–86%; Abbate-Daga et al., 2015; Fittig et al., 2008; Jones et al., 2007; Treat, McCabe, Gaskill, & Marcus, 2008; Willinge et al., 2010; Zeeck et al., 2004). In these studies, follow-up retention rates were lower for studies with larger sample sizes, with the largest sample retaining 43% of those who initially enrolled in the study (Fittig et al., 2008). Thus, despite the substantial loss to follow-up, the present study represents the highest follow-up retention rate in a large sample of ED PHP patients. Although patients lost to follow-up did not have more severe ED symptoms at baseline, they had a shorter length of stay and were more likely to discharge against clinical advice. Thus, it is possible that patients who responded to follow-up inquiries may be skewed towards recovery; consequently, results should be interpreted with this important limitation in mind.

The generally low retention rates at follow-up across PHP outcome studies (Friedman et al., 2016), including the present study, highlight the continued need to improve follow-up rates in naturalistic ED treatment outcomes research. Although naturalistic studies typically lack the financial resources set aside in RCTs for recruitment and retention, there are a few potential strategies that may help improve retention at follow-up in future studies of higher levels of care. First, clinics could make efforts to ensure that contact information upon discharge is complete and includes multiple methods to contact patients, including permission to contact carers if the patient changes their contact information following discharge. Personalized messages to patients during the follow-up period and/or calling patients who have not completed follow-up surveys may also be helpful. Lastly, directly discussing low follow-up retention rates and problem-solving with patients while enrolled in clinical programming could generate new and effective strategies and help gather information on possible barriers/motivations for completing follow-up assessments. Without better methods to retain participants at follow-up in naturalistic PHP studies, there are limits to the conclusions that can be drawn from such studies.

5 | CONCLUSIONS

Historically, long-term outcomes indicate that a substantial percentage of ED patients demonstrate a long-standing course of illness (Arcelus et al., 2011), highlighting the importance of examining outcomes for higher levels of care in the treatment of EDs. The present study extends the established literature demonstrating the effectiveness of PHP level of care for severe EDs to patients with severe comorbidities and documents differences in outcome across AN subtypes. Given that our PHP included a variety of treatment components and methods, this limits conclusions that can be made regarding mechanisms of action. As such, future studies should seek to conduct component analyses to determine which components are most efficacious in improving outcomes in higher levels of care and help inform continued treatment refinement. Given the variability in methodology across studies, future research should also aim to follow standard guidelines for outcome assessment and reporting (see Attia, Marcus, Walsh, & Guarda, 2017) to help generate a repository of data that could be used to better understand the effectiveness of PHPs and to further identify specific predictors of outcome and remission.

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SUPPORTING INFORMATION

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