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Behavioral activation in acute inpatient psychiatry: A multiple baseline evaluation

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ABSTRACT

Background and objectives: The present study employed a multiple baseline study design with repeated measures to explore clinical outcomes, therapy mechanisms, and feasibility of Behavioral Activation for persons admitted to inpatient psychiatry.
Methods: Six adult inpatients with depressive symptoms and different psychiatric disorders were randomized to different lengths of baseline standard inpatient treatment. Subsequently a 5-day, 10-session Behavioral Activation protocol was added. Daily self-report outcome and process measures were administered and supplemented with hourly self-reports and clinician assessments before and after each study phase.
Results: After a relatively stable baseline, at least four participants showed marked gradual improvements both in terms of outcome as well as activation and avoidance as Behavioral Activation was initiated. The temporal relation between process and outcome differed somewhat across metrics. In most instances however, change in activation and avoidance either coincided or preceded decreased depression.
Limitations: We did not include some relatively common disorders, did not control for the effects of increased attention, did not investigate treatment integrity, and did not conduct follow-up after discharge. Raters were not blind and measures were mainly focused on depressive symptoms. All received concurrent medical treatment.
Conclusions: This preliminary study further supports the promise of Behavioral Activation as an inpatient treatment for persons with a variety of psychiatric disorders. Results also lends preliminary support for the purported mechanisms of Behavioral Activation.

1. Introduction

Over the last decades the number of beds (Fakhoury & Priebe, 2002) and length of admissions (Watanabe-Galloway & Zhang, 2007) in inpatient psychiatric care have reduced drastically. Current inpatient services are frequently criticized for being socially disengaging (Sharac et al., 2010), not being guided by empirical research (Goldman, 2011), and staff report high levels of job dissatisfaction and burn out (Gilbody et al., 2006). Meta-analytic studies indicate inpatients benefit from psychological treatment (Cuijpers et al., 2011; Kösters, Burlingame, Nachtigall, & Strauss, 2006; Stuart & Bowers, 1995; Xia, Merinder, & Belgamwar, 2011) but access to such therapy is restricted.

Behavioral Activation (BA) is a well-established treatment for major depression (Mazzucchelli, Kane, & Rees, 2009), with effects comparable to gold standard Cognitive Behavior Therapy (CBT) and antidepressant medication (Dimidjian et al., 2006; Moradveisi, Huibers, Renner, Arasteh, & Arntz, 2013). The treatment is aimed at engaging clients in personally meaningful behavior and at reducing avoidant coping strategies. BA originates from early behavioral models proposing that depression results from low levels of reinforcement and over-reliance on avoidant coping (Ferster, 1973; Lewinsohn, 1974). There are currently two BA

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versions being implemented widely, the Behavioral Activation Treatment for Depression (BATD) developed by Lejuez, Hopko, and Hopko (2001) and the version developed by Jacobson, Martell, and Dimidjian (2001).

BA has been proposed to be particularly well suited for inpatient environments (Curran, Lawson, Houghton, & Gournay, 2007; Folke et al., in press). Hopko, Lejuez, Lepage, Hopko, and McNeil (2003) conducted a pilot randomized trial of the BATD for depressed inpatients ($N = 25$). Results indicated a restricted number of BATD sessions were significantly more effective in reducing depression scores than a control supportive therapy condition. Gollan et al. (2014) developed a milieu-based approach for heterogeneous inpatient populations called Behavioral Activation Communication (BAC). In a non-randomized comparison with an otherwise similar treatment ward BAC showed a greater increase in activity engagement and positive affect. Two studies have investigated BA for depressed geriatric inpatients (Brand & Clingempeel, 1992; Snarski et al., 2011) with equivocal but promising results. Magidson et al. (2011) adapted BATD for inpatient substance users with depressive symptoms and found significantly better substance use treatment retention and increased activation for BATD in a randomized comparison to supportive counseling. Folke et al. (in press) reported in a small open trial that BA was feasible when initiated during inpatient care and continued in outpatient care after discharge. Taken together, BA appears to be a promising and feasible treatment for diverse inpatient populations but research is preliminary. Studies so far have been small, conducted in varied settings with different levels of acuteness.

The empirical research regarding BA's purported mechanism, that increased activation behavior results in increased environmental rewards and decreased symptoms, is sparse (Dimidjian, Barrera, Martell, Muñoz, & Lewinsohn, 2011; Manos, Kanter, & Busch, 2010). In a single subject study by Gaynor and Harris (2008), activation appeared to mediate outcomes in 50% of participants. Collado, Castillo, Maero, Lejuez, and MacPherson (2014) found, in a small pilot trial, that depression improved in tandem with activation and was preceded by environmental reward. In another case study by Manos, Kanter, and Luo (2011) activation preceded depression improvement in one client and was concurrent with improvement in the other. No studies have investigated the temporal relation between BA mechanisms and outcome in inpatient contexts. Gollan et al.(2014) did administer an inpatient specific activation and avoidance measure at admission and discharge. A significantly greater degree of activation was found in the BA group relative to the control group. However, demonstration of temporal relations requires repeated assessments throughout treatment.

The aim of the current study was to investigate the mechanisms and efficacy of inpatient BA for depressive symptoms in patients with different psychiatric disorders. As an initial test we used a Single Case Experimental Design (SCED) with six inpatients. A multiple baseline study design was employed so that participants received BA after differing lengths of standard treatment. This design has considerable advantages in the preliminary stages of research. As opposed to open trials the multiple baseline study offers an experimental control condition. Compared to the gold standard Randomized Controlled Trial (RCT) it requires fewer participants as every participant acts as their own control. In the busy and unpredictable inpatient environment it is challenging to obtain larger samples and conduct stringent RCTs, instead a restricted number of participants can be studied in greater detail as they are present round the clock. Several researchers have also argued that the intensive SCED is particularly well suited for studying mechanisms of change (Gaynor & Harris, 2008; Manos et al., 2010).

2. Methods

2.1. Participants

Six patients from three acute general psychiatric inpatient wards in Dalarna, Sweden, were included. Eligible patients scored ≥20 on the self-report version of the *Montgomery–Åsberg Depression Rating Scale* (MADRS-S; Svanborg & Åsberg, 1994), did not suffer significant confusion (due to dementia, intoxication, acute psychosis, etc.), and were able to read and speak Swedish. The study protocol required patients to participate in an intensive assessment and treatment program for 6–11 days. Thus, patients planned to be discharged before this and patients involved in some other time intensive treatment program were non-eligible. Fig. 1 presents the patient flow. A total of 55 patients were screened. Of these, $n = 10$ were non-eligible due to personal characteristics and $n = 33$ due to reasons related to the length and intensity of the study. A total of 12 patients were thus considered eligible. However, prior to enrollment the research group had planned to include only six participants. We considered the most ethical way of selecting the participants was to ask the ward psychiatrist and staff to agree on what patients had the greatest clinical needs for intensified treatment. Clinical needs were defined as: (a) having difficulty engaging in the ward milieu, and (b) not showing signs of significant improvement. This was decided without the involvement of the research group. Table 1 presents the six included participants' demographic and clinical characteristics.

2.2. Design

A multiple baseline design across individuals was used. Participants were recruited two at a time and thus the design is best labeled non-concurrent or partially concurrent. Participants were randomized to one of the six pre-defined baseline lengths. The BA intervention was added to the standard inpatient treatment program that was not manipulated in any way during our study. The procedure of the study is presented in Fig. 1. Three non-concurrent study periods were conducted, one for each inpatient ward, during October 2013 to January 2014. Participants were informed about the study and gave their verbal and written consent. The clinical diagnoses from patient charts were supplemented with The *Mini-International Neuropsychiatric Interview* (M.I.N.I.; Sheehan et al., 1998), the general diagnostic criteria from the *Structured Clinical Interview for DSM-IV Personality Disorders* (SCID-II; First, Spitzer, Gibbon, & Williams, 1995), and the self-reported criteria in the SCID-Screen (Ekselius, Lindstrom, Von Knorring, Bodlund, & Kullgren, 1994) for Borderline Personality Disorder (BPD) and Avoidant Personality Disorder (APD). They were further screened using the MADRS-S (Svanborg & Åsberg, 1994) and were required to have a score of 20 or higher to be eligible for the study.

Allocation to baseline length was performed by a person who was not involved in the research. The inpatient team administered clinical outcome assessments at three assessment points (before baseline, post baseline, and post BA). Neither participants nor raters were informed of respective baseline lengths. Raters were not part of the research group and none of them had received any more than basic information about BA. Hourly and daily assessments were initiated and continued throughout the baseline and treatment period. Daily measures were administered at the end of the day, after completing the day's scheduled sessions or other standard care activities. Participants were reminded (by the study leader and nurses) at least three times every day during baseline to complete the hourly assessments. These reminders also entailed brief supportive questions. Treatment was initiated directly after completion of the allocated baseline period and the assessments that followed.

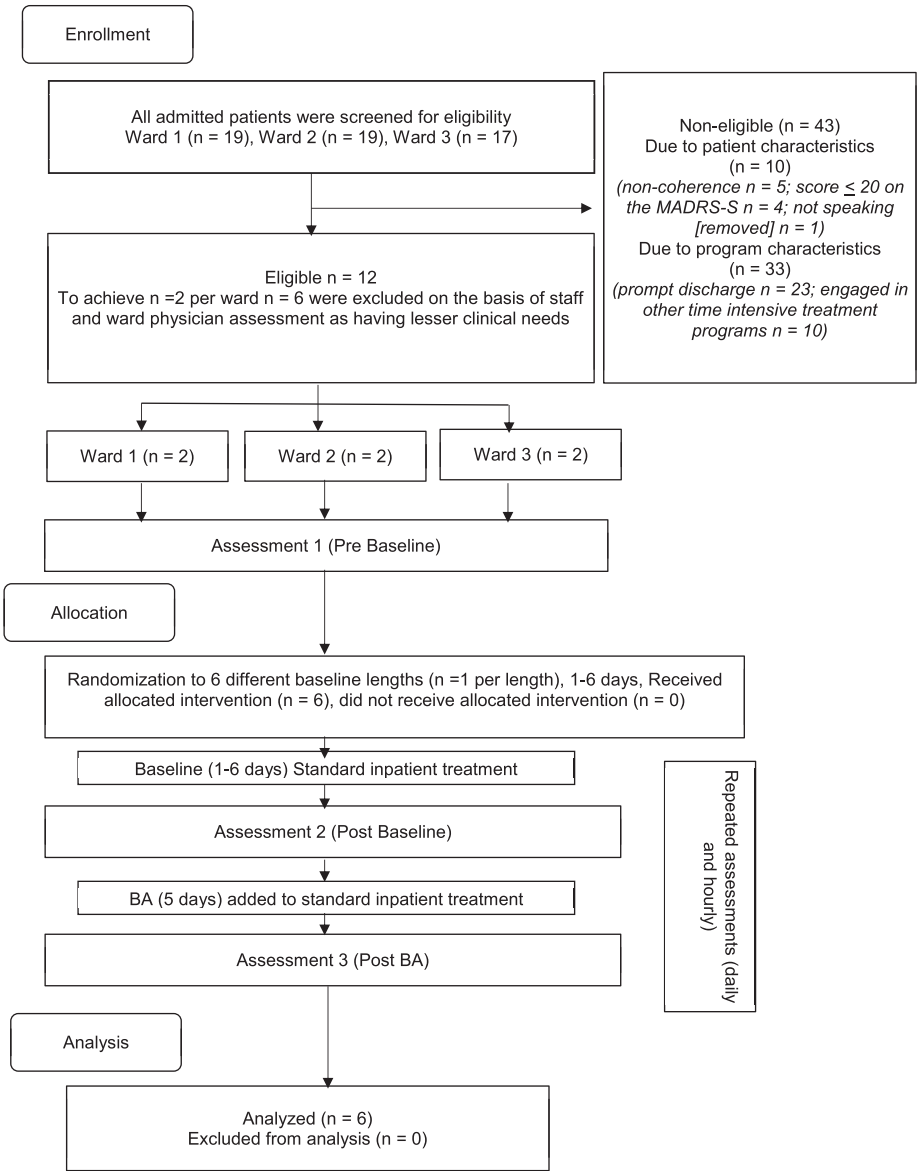

Fig. 1. Participant flow chart and overview of study assessment procedures.

Approval was obtained from The Regional Ethics Committee.

2.3. Outcome measures

The primary outcome measure was the MADRS-S (Svanborg & Åsberg, 1994). It was administered daily to measure depressive symptoms. It contains nine items, each rated from 0 to 6 and total scores range from 0 to 54 with high scores representing more depressive symptoms. It has high test–retest reliability (.80–.94). Item 9 of MADRS-S is an assessment of suicidal ideation and it was reported separately as it was considered of particular relevance.

The primary outcome measure was supplemented with a range of secondary measures administered before and after every study phase and self-report measures completed on an hourly basis. The 10-item clinician rating version of the MADRS (Montgomery & Asberg, 1979) was used assess depressive symptoms before and after every study phase. The *Clinical Global Impression Scales* (CGI; Guy, 1976) were used to obtain clinician ratings of global clinical severity (CGI-S) and improvement (CGI-I) following baseline and BA treatment. The CGI-S ranges from 1 (normal, not at all ill) to 7 (extremely ill). The CGI-I ranges from 1 (very much improved) to 7 (very much worse). The momentary level of depression was measured using an hourly diary to be completed from 7 am to 11 pm (if awake). Participants were asked to rate how depressed they had felt the last hour on a scale ranging from 1 (not at all) to 10 (very much). Reminders were used to ensure that participants would continuously fill out the diary as opposed to completing it at the end of the day.

2.4. Process measures

The *Checklist of Unit Behaviors* (CUB; Hanson, Hoxha, Roberts, & Gollan, 2013) was used on a daily basis to measure the extent to which participants avoided or engaged with the treatment milieu. It is a self-report instrument developed specifically for assessing inpatient activity and avoidance with nine items assessing approach behaviors (CUB approach) and seven items assessing avoidance behaviors (CUB avoidance). Approach behavior scores

ranges from 0 to 36 with high scores representing greater engagement. Avoidance behavior scores ranges from 0 to 28 with high scores representing greater avoidance. The CUB has good internal consistency (.79–.93). The CUB was supplemented with the self-report measure *Behavioral Activation for Depression Scale – Short Form* (BADS-SF; Manos et al., 2011). It was used to assess activation and avoidance in general and items do not specifically describe situations related to the ward milieu. It was administered before and after every study phase. It contains nine items each rated from 0 (not at all) to 6 (completely) and total scores ranges from 0 to 54 with high scores representing more activation and less avoidance. The internal consistency of the BADS-SF is .82 (Manos et al., 2011). The hourly diary mentioned above was also used to measure the degree of engagement in activity. Participants were asked to rate to what degree they were engaged in a pleasant or important activity the last hours on a scale ranging from 1 (not at all) to 10 (very much).

2.5. Feasibility measures

Participants' satisfaction with treatment was measured following treatment using *Client Satisfaction Questionnaire* (CSQ-8; Larsen, Attkisson, Hargreaves, & Nguyen, 1979). It contains 8 items each rated from 1 to 4 and total scores range from 8 to 32 with high scores representing higher satisfaction. Staff perception of the BA approach was measured with a simple question ("I believe BA is a useful approach for inpatient settings") rated on a scale from 0 (not at all) to 10 (completely). They were also asked to indicate possible barriers for using the BA approach independently of the research team in routine care.

2.6. Treatment and therapists

The BA protocol was based on the manual by Kanter, Busch, and Rusch (2009). It is a synthesis of the two most widespread versions of contemporary BA, the model developed by Jacobson et al. (2001) and BATD (Lejuez, Hopko, Acierno, Daughters, & Pagoto, 2011; Lejuez et al., 2001). The protocol was adapted to fit the inpatient milieu and to be integrated with the nursing procedures. The main adaptations consisted of making all the procedures shorter due to the limited time available, increasing focus on very small and direct behavioral changes, and trying out parts of scheduled activities in-vivo during the sessions in order to identify obstacles and come up with solutions to difficulties. The treatment consisted of two daily 20–30 min sessions over a period of five days (i.e., 10 sessions). The sessions were led by the first author. He is a psychologist/psychotherapist formally trained and specialized in CBT (MSc/PhD student) with ten years' experience from working in psychiatry. He also received training in BA from one of the authors' (J.W.K.) BA research lab. Nurses from the ward were co-therapists. The role of the co-therapist nurse was to contribute with their ward environment expertise during sessions, to keep the inpatient team informed about sessions, and to check in briefly on progress with homework assignments throughout the day. Nurses were not formally trained in BA prior to the study. Session recordings for fidelity checking were considered but the research group chose to refrain from this as the assessment and treatment procedures of the study were expected to be perceived as demanding enough for participants already in acute stress.

In Session 1 the therapist conducted a brief ideographic behavioral case conceptualization to provide an understanding of how mental health problems had developed and were maintained. Then the therapist provided the rationale for how mental health could be improved using BA. Self-monitoring was initiated in order for participants to learn more about the relation between activity and mood. In Session 2 personal values, goals and problems were discussed and listed. Drawing on these, and information about previously enjoyed activities, an activity hierarchy was constructed. It specified activities of varying difficulty. Each day a number of activities were drawn from the hierarchy and they were scheduled as homework between sessions. The goal of activation was to engage in pleasant activities but also to take steps towards solving acute problems in the current life situation and to start approaching feared situations. At the end of Session 2, one or two of the activities on the list were scheduled. The remaining eight sessions included scheduling activities, applying problem solving for activation barriers, evaluating the experience and consequences of activation, and revisiting and expanding the BA rationale. Later in therapy participants were encouraged to take greater responsibility for planning activation and problem solving and the therapist faded the use of instructions whenever possible. At the end brief relapse prevention strategies were employed. Readers interested in a more detailed description of the session contents are referred to our previous paper (Folke et al., in press).

2.7. Analytic plan

Visual inspection of baseline stability and changes in outcome and process measures across study phases were supplemented with statistical methods. Changes in daily measures and clinician ratings were assessed using The Reliable Change Index (RCI; Jacobson & Truax, 1991). When calculating RCI we used reference data (*M*, SD, and instrument reliability) from Cunningham et al. (2011) for MADRS-S and MADRS. For the CUB we consulted Gollan et al. (2014). For the BADS-SF we used data from our own research (Folke et al., in press). A further validation of clinically significant change was a 50% reduction in MADRS-S and MADRS scores together with clinician ratings of "much improved" or "very much improved" on the CGI-I. The magnitude of change between phases was also measured using the Non-overlap of All Pairs (NAP; Parker & Vannest, 2009). It is a nonparametric calculation of non-overlap, or effect size, between phases. Scores below 0.65 are considered weak effects, scores from 0.66 to 0.91 moderate, and scores from 0.92 to 1.0, strong effects.

The relation between the purported mechanisms of BA and outcome (i.e., the mediating role of activation and avoidance) was assessed with visual inspection and supplemented with statistical procedures. The timing of change was determined using the RCI described above. However, this may prevent the detection of smaller changes. Thus we supplemented RCI with a standardization method from Gaynor and Harris (2008). Ipsative *z*-scores were calculated and their direction was determined as being either a positive or negative. Scores suggesting a change in a therapeutic direction were coded 1, and all other scores were coded 0. Furthermore, cross-lagged correlations were calculated to determine the correlation between repeated process and outcome measures (Borckardt et al., 2008). Positive lags suggest that the process measure (e.g., CUB approach) precedes the change in an outcome measure (e.g., MADRS-S) and for negative lags the opposite is true. The number of the lag is the number of assessment points separating the two measures (e.g., at lag +3 the correlation between a process measure and the outcome measure three assessment points later is investigated).

3. Results

All admitted patients at the three wards ($N = 55$) were screened for eligibility. The majority were non-eligible due to the study- and inpatient ward characteristics ($n = 33$) and only 10 due to patient characteristics (see Fig. 1). None declined to participate in the study.

Only one participant (P4) failed to attend two sessions. An overview of missing data is provided in Table 3. No clinician ratings were missing but occasional daily assessments were missing for P4 and P6. The number of diary ratings each day was not pre-defined and the number of diary data points are available in Table 3.

3.1. Baseline stability

According to visual inspection, RCI, and ipsative *z*-scores, no improvements were observed on daily measures of MADRS-S (including the suicidal ideation item) or CUB scales throughout the baseline (see Table 2), with the exception of P4. This was paralleled by the absence of change on the clinician ratings before treatment (see Table 4). Diary ratings displayed great variability throughout the study. Ordinary least square trend-lines were imposed on the graphs to reveal possible slopes (see Figs. 3 and 4). Visual inspection of the diary measures indicated only two possible improvements, one regarding mood (P3) and one in terms of activation (P4).

3.2. Outcomes

Visual inspection of the primary outcome measure, the MADRS-S (Fig. 2), indicated that five of six participants evidenced a gradual

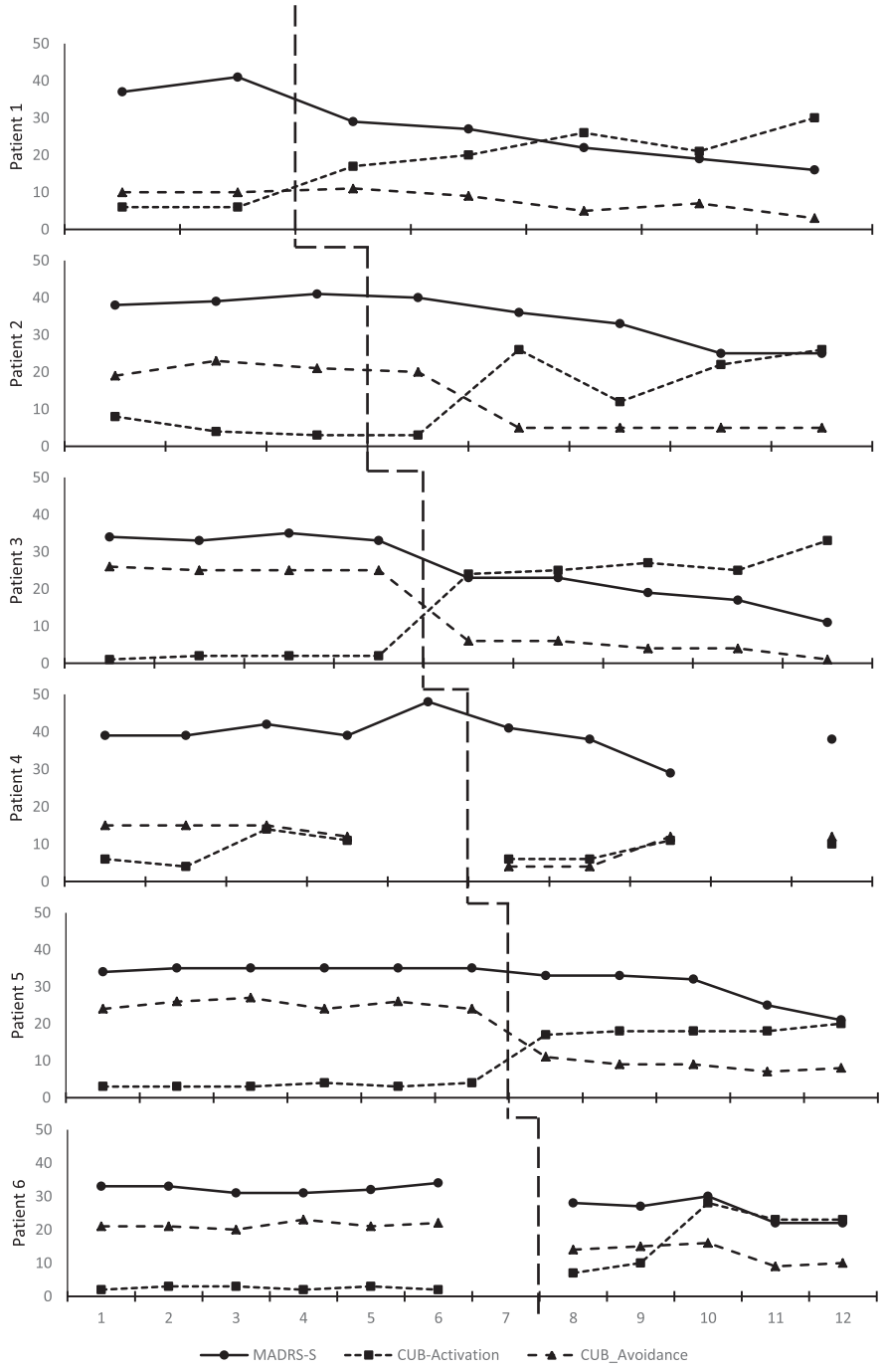

Fig. 2. Daily self-reported measures of depression, Activation and Avoidance for participants P1 to P6. The end of the baseline is marked by the vertical line.

Table 1
Patient characteristics.

Variable	P1	P2	P3	P4	P5	P6
Age	35	45	64	22	30	20
Sex	Female	Female	Male	Female	Female	Male
Marital status	Married	Single	Single	Single	Single	Single
Employment	Unemployed	Pension Disability	Pension Disability	Unemployed	Pension Disability	Student
Diagnoses (by ward psychiatrist)	Preliminary OCD	MDD, PDA	Bipolar, ALC	MDD, prel. BPD or Bipolar	BPD, PTSD	MDD and prel. SCHIZ.
Axis-I diagnoses (M.I.N.I.)	MDD, OCD, PTSD	MDD, PDA	MDD, MAN, ALC	MDD, MAN, GAD	MDD, PTSD,	MDD, PDA, SAD, ALC
Axis-II (interview)	No	No	No	Yes	Yes	No
Reason for adm.	Observation due to commanding voices or intrusive thoughts	Suicide risk	Apathy and escalating depression	Self-harm, Suicide risk	Self-harm, Suicide risk, dissociation	Escalating depression, Suicide risk
Previous adm.	0	2	>20	2	>20	0
Adm. duration before study	7 days	4 days	10 days	12 days	36 days	2 days
Improvements noted in charts prior to study	No	No	Improved anxiety	No	No (on continued observation)	No
Medication prior to admission	AD	BENZ., AD, HYP	AP, AD, ANX, HYP	AD, ANX	AD, AP, HYP, ANX	–
Medication changes during study	+ANX, +AP	−BENZ, +HYP (S)AD	+AD	+AP, HYP	No changes	+AD, +AP, +HYP

Note. MDD = Major Depressive Disorder; OCD = Obsessive Compulsive Disorder; PDA = Panic Disorder with Agoraphobia; BPD = Borderline Personality Disorder; PTSD = Post Traumatic Stress Disorder; MAN = Manic Episode; GAD = Generalized Anxiety Disorder; ALC = Alcohol Dependence; SCHIZ = Schizophrenia; Adm = Admission; AD = Antidepressants; ANX = Anxiolytics; AP = Antipsychotics; BENS = Benzodiazepines; HYP = Hypnotics; + indicated increased dosages of a medication; − indicated a decrease in dosage of medication; (S) indicated a switch in medication.

improvement during BA. This was also true for the suicidal ideation item of the MADRS-S (see Table 2). The pattern was confirmed by ipsative *z*-scores and RCI (see Table 2). P4 did report a reliable improvement in MADRS-S during treatment but returned to baseline levels. Improvements in the MADRS-S were paralleled by the results on the clinician rated MADRS (see Table 4). Two participants reduced their MADRS-S score below 50% of their pre score on MADRS-S and three on the MADRS. NAP scores (see Table 3) indicated strong effect sizes for MADRS-S in 4 of the participants (P1, P3, P5 and P6) and a moderate effect size in the others (P2 and P4). Clinician ratings with the CGI-I indicated that at least four of the six participants had improved much or very much. One was rated as being in between minimally and much improved (P6). Visual inspection of the diary mood ratings and the imposed trend lines indicated mood improved to some degree relative to the baseline in all participants (see Fig. 3). NAP scores (Table 3) for hourly diary rating of mood was less compelling with only one participant displaying a strong effect size.

Table 2
Total scores, ipsative *z*-scores, and reliable change on daily measures during baseline and treatment.

Participant	Measures	Baseline							BA				
		A	A	A	A	A	A	A	B1	B2	B3	B4	B5
P1	MADRS-S						37 (0)	41 (0)	29 (0)	27* (1)	22* (1)	19* (1)	16** (1)
	Suic. Id. item						4 (0)	3 (0)	3 (0)	2 (1)	2 (1)	2 (1)	1 (1)
	CUB-Approach						6 (0)	6 (0)	17* (0)	20* (1)	26* (1)	21* (1)	30* (1)
	CUB-Avoidance						10 (0)	10 (0)	11 (0)	9 (0)	5 (1)	7 (1)	3 (1)
P2	MADRS-S					38 (0)	39 (0)	41 (0)	40 (0)	36 (0)	33 (1)	25* (1)	25* (1)
	Suic. Id. Item					4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	2 (1)	2 (1)
	CUB-Approach					8 (0)	4 (0)	3 (0)	3 (0)	26* (1)	12 (0)	22* (1)	26* (1)
	CUB-Avoidance					19 (0)	23 (0)	21 (0)	20 (0)	5* (1)	5* (1)	5* (1)	5* (1)
P3	MADRS-S				34 (0)	33 (0)	35 (0)	33 (0)	23* (1)	23* (1)	19* (1)	17** (1)	11** (1)
	Suic. Id. Item				3 (0)	3 (0)	3 (0)	3 (0)	2 (1)	2 (1)	2 (1)	2 (1)	0 (1)
	CUB-Approach				1 (0)	2 (0)	2 (0)	2 (0)	24* (1)	25* (1)	27* (1)	25* (1)	33* (1)
	CUB-Avoidance				26 (0)	25 (0)	25 (0)	25 (0)	6* (1)	6* (1)	4* (1)	4* (1)	1* (1)
P4	MADRS-S			39 (1)	39 (1)	42 (0)	39 (1)	48 (0)	41 (0)	38 (1)	29* (1)	–	38 (1)
	Suic. Id. Item			6 (0)	6 (0)	6 (0)	6 (0)	6 (0)	6 (0)	6 (0)	4 (1)	–	6 (0)
	CUB-Approach			6 (0)	4 (0)	14* (1)	11 (1)	–	6 (0)	6 (0)	11 (1)	–	10 (1)
	CUB-Avoidance			15 (0)	15 (0)	15 (0)	12 (0)	–	4* (1)	4* (1)	12 (0)	–	12 (0)
P5	MADRS-S		34 (0)	35 (0)	35 (0)	35 (0)	35 (0)	35 (0)	33 (0)	33 (0)	32 (1)	25 (1)	21* (1)
	Suic. Id. Item		4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	5 (0)	4 (0)	3 (1)	3 (1)
	CUB-Approach		3 (0)	3 (0)	3 (0)	4 (0)	3 (0)	4 (0)	17* (1)	18* (1)	18* (1)	18* (1)	20* (1)
	CUB-Avoidance		24 (0)	26 (0)	27 (0)	24 (0)	26 (0)	24 (0)	11* (1)	9* (1)	9* (1)	7* (1)	8* (1)
P6	MADRS-S	33 (0)	33 (0)	31 (0)	31 (0)	32 (0)	34 (0)	–	28 (1)	27 (1)	30 (0)	22* (1)	22* (1)
	Suic. Id. Item	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)		2 (1)	3 (1)	3 (1)	2 (1)	2 (1)
	CUB-Approach	2 (0)	3 (0)	3 (0)	2 (0)	3 (0)	2 (0)	–	7 (0)	10* (1)	28* (1)	23* (1)	23* (1)
	CUB-Avoidance	21 (0)	21 (0)	20 (0)	23 (0)	21 (0)	22 (0)	–	14 (1)	15 (1)	16 (1)	9* (1)	10* (1)

Note. MADRS-S = Montgomery–Asberg Depression Rating Scale Self rating version; CUB = Checklist of Unit Behaviors; A = Days of baseline; B1–B5 = Days of Behavioral Activation treatment; * = Reliable change according to Jacobson and Truax (1991) on the MADRS-S and CUB scales, ** = ≥50% reduction on the MADRS-S, Parenthetical values = ipsative *z*-scores transformed into 1 (improvement) or 0 (no change or deterioration).

Table 3
Data points, missing data, Means, standard deviations and NAP-scores for all participants on daily and hourly measures.

Participant	Measure	*N* = assessments Baseline/BA (*n* = missing Baseline/BA)	Baseline *M* (SD)	BA *M* (SD)	NAP CI (90%)
P1	MADRS-S	2/5 (0)	39.0 (2.83)	22.6 (5.41)	1.0 (0.151<>1.849)
	Suic. Id Item	2/5 (0)	3.5 (0.71)	2 (0.71)	0.95 (0.051<>1.749)
	CUB-App.	2/5 (0)	6 (0)	22.8 (5.17)	1.0 (0.151<>1.849)
	CUB-Avo.	2/5 (0)	10 (0)	7 (3.16)	0.8 (−0.249<>1.449)
	Mood diary	13/63	7.54 (1.13)	5.43 (1.61)	0.86 (0.423<>1.005)
	Engagement diary	13/63	3.77 (1.24)	6.48 (2.12)	0.84 (0.380<>0.963)
P2	MADRS-S	3/5 (0)	39.33 (1.52)	31.8 (6.69)	0.87 (−0.002<>1.469)
	Suic. Id Item	3/5 (0)	4.0 (0)	3.2 (1.2)	0.7 (0.336<>1.136)
	CUB-App.	3/5 (0)	5.0 (2.65)	17.8 (10.06)	0.83 (−0.069<>1.402)
	CUB-Avo.	3/5 (0)	21.0 (2.0)	8.0 (6.71)	0.93 (0.131<>1.602)
	Mood diary	32/68	8.84 (1.05)	6.64 (1.32)	0.89 (0.567<>0.977)
	Engagement diary	32/68	3.75 (0.92)	7.10 (1.69)	0.94 (0.679<>1.088)
P3	MADRS-S	4/5 (0)	33.75 (0.96)	18.6 (4.98)	1.0 (0.328<>1.672)
	Suic. Id Item	4/5 (0)	3.0 (0)	1.6 (0.89)	1.0 (0.328<>1.672)
	CUB-App.	4/5 (0)	1.75 (0.5)	26.8 (3.63)	1.0 (0.328<>1.672)
	CUB-Avo.	4/5 (0)	25.25 (0.5)	4.2 (2.05)	1.0 (0.357<>1.643)
	Mood diary	42/64	6.78 (1.48)	2.21 (1.44)	0.96 (0.722<>1.101)
	Engagement diary	41/66	1.48 (1.45)	5.42 (2.32)	0.93 (0.670<>1.066)
P4	MADRS-S	4/5 (0/1)	41.4 (3.91)	36.5 (5.2)	0.85 (0.028<>1.372)
	Suic. Id Item	4/5 (0/1)	6.0 (0)	5.5 (1.0)	0.625 (−0.422<>0.922)
	CUB-App.	4/5 (1/1)	8.75 (4.57)	8.25 (2.63)	0.47 (−0.775<>0.650)
	CUB-Avo.	4/5 (0/1)	14.25 (1.5)	8.0 (4.62)	0.94 (0.163<>1.587)
	Mood diary	66/57	8.38 (2.29)	8.54 (1.97)	0.52 (−0.138<>0.207)
	Engagement diary	66/57	3.21 (2.61)	2.91 (2.74)	0.43 (0.320<>0.025)
P5	MADRS-S	5/5 (0)	34.83 (0.41)	28.8 (5.5)	1.0 (0.399<>1.601)
	Suic. Id Item	5/5 (0)	4.0 (0)	3.8 (0.84)	0.6 (−0.401<>0.801)
	CUB-App.	5/5 (0)	3.33 (0.52)	18.2 (1.1)	1.0 (0.399<>1.601)
	CUB-Avo.	5/5 (0)	25.17 (1.33)	8.8 (1.48)	1.0 (0.399<>1.601)
	Mood diary	75/69	7.32 (0.68)	6.49 (1.36)	0.68 (0.201<>0.519)
	Engagement diary	75/69	2.52 (0.92)	4.88 (2.81)	0.77 (0.376<>0.694)
P6	MADRS-S	6/6 (1/0)	32.33 (1.21)	25.8 (3.63)	1.0 (0.399<>1.601)
	Suic. Id Item	6/6 (1/0)	4.0 (0)	2.4 (0.55)	1.0 (0.399<>1.601)
	CUB-App.	6/6 (1/0)	2.5 (0.55)	18.2 (9.15)	1.0 (0.399<>1.601)
	CUB-Avo.	6/6 (1/0)	21.33 (1.03)	12.8 (3.11)	1.0 (0.399<>1.601)
	Mood diary	77/55	7.14 (0.85)	6.20 (1.78)	0.68 (0.184<>0.521)
	Engagement diary	77/55	1.87 (0.66)	3.82 (1.56)	0.87 (0.567<>0.904)

Note. BA = Behavioral Activation; NAP = Non-overlap of All Pairs; MADRS-S = Mongomery-Asberg Depression Rating Scale Self rating version; CUB-App = Checklist of Unit Behavior (the approach sub-scale); CUB-Avo = Checklist of Unit Behavior (the avoidance sub-scale); Suic. Id Item = Item 9 in MADRS-S.

3.3. Change in process

Visual inspection of CUB approach and avoidance scores (Fig. 2) indicated that five of six participants evidenced gradual improvements during BA. The pattern was confirmed by ipsative *z*-scores (See Table 2). Reliable change was achieved on CUB approach in five of six participants (everyone but P4), and reliable change on CUB avoidance was achieved in four of six participants. P4 returned to baseline levels at Day 3 and P6 did not achieve reliable change on CUB avoidance at all. The changes in CUB was mainly confirmed by reliable change in the BADS-SF after treatment (see Table 2). However on the BADS-SF all participants achieved reliable change post BA. NAP scores (Table 3) indicated strong effect sizes for four participants on the CUB approach and five on the CUB avoidance. Visual inspection indicated diary ratings of engagement in activation appeared improved relative to baseline in all participants but not P4 (see Fig. 4). NAP scores (Table 3) indicated strong effect sizes in two (P2 and P3), modest effect sizes in three (P1, P5 and P6) and a negative effect in one participant (P4).

3.4. Relation between process and outcome

Inspection of the RCI and ipsative *z*-scores for the CUB scales and MADRS-S indicate CUB approach changed prior to MADRS-S in P1, P2 and P5. In P3 the change was concurrent and in P6 ipsative *z*-scores occurred first in MADRS-S but RCI on the other hand was achieved first in CUB approach (see Table 2). CUB avoidance changed prior to MADRS-S in P2 and P5. In participants P3 and P6 CUB avoidance changed concurrently with MADRS-S. These relations were further tested with cross-lagged correlations (see Table 5). Significant correlations indicated that CUB approach preceded changes in MADRS-S for P2 (Lag +01) and P6 (Lag +01). A significant direct correlation (Lag 0) was observed for P1. Significant correlations indicated that CUB avoidance preceded changes in MADRS-S for P4 (Lag +01) and was direct (Lag 0) for P3 and P6. Visual inspection of the relationship between diary ratings of mood and engagement in activity were difficult given the variability in scores (Figs. 3 and 4). It appears that activation and mood changed in tandem for P1, P2, P5 and P6. Mood appeared to improve before activation in P3. For P4 there was no apparent pattern. Cross-lagged correlations of the relation between diary ratings of engagement in activity and mood yielded multiple significant results and it appeared that both variables significantly preceded the other for every participant (the results are not included in the Table). The only exception was P4 for whom no significant cross-lagged correlations were observed.

3.5. Feasibility measures

Participant ratings indicated high treatment satisfaction measured with the CSQ-8 ($M = 30$, SD = 3.16). Staff ratings ($n = 17$) indicated the treatment approach was perceived as useful for inpatient settings ($M = 8.12$, SD = 1.36). The most commonly indicated barriers for using the BA approach without the assistance of the research team were lack of time (82.4%) and lack of competence among staff members (29.4%).

Table 4
Participants' total scores on measures administered before/after baseline and treatment.

Participant	Measures	Pre A	Post A	Post B
P1	MADRS	39	44	13**
	CGI-S/	Markedly	No	Very much improved
	CGI-I	ill	change	
	BADS-SF	17	15	30*
P2	MADRS	37	39	12**
	CGI-S/	Markedly	No	Much improved
	CGI-I	ill	change	
	BADS-SF	10	10	37*
P3	MADRS	40	41	9**
	CGI-S/	Seriously	No	Very much improved
	CGI-I	ill	change	
	BADS-SF	9	10	34*
P4	MADRS	36	48	26
	CGI-S/	Markedly	No	Minimally improved
	CGI-I	ill	change	
	BADS-SF	15	14	23*
P5	MADRS	36	38	27*
	CGI-S/	Seriously	No	Much improved
	CGI-I	ill	change	
	BADS-SF	15	14	31*
P6	MADRS	40	40	32*
	CGI-S/	Seriously	No	Between minimally and much
	CGI-I	ill	change	improved
	BADS-SF	7	4	27*

Note. P1–P6 = Participants; MADRS = Montgomery Depression Rating Scale (clinician rating); CGI-S = Clinical Global Impression – Severity; CGI-I = Clinical Global Impression – Improvement; BADS-SF = Behavioral Activation for Depression Scale (Short Form); * = Reliable change according to Jacobson and Truax (1991); ** = ≥50% reduction on the MADRS.

4. Discussion

The current study examined the efficacy, mechanisms of change, and feasibility of a brief team-based BA intervention added to the standard acute inpatient psychiatric treatment.

In relation to efficacy, the baseline period did not appear to improve symptoms. The only exceptions were a temporary improvement in P4 on the MADRS-S, an improvement in the hourly diary mood measures for P3, and a minor improvement trend in the mood diary for P2. The lack of improved symptoms and activation/avoidance during standard treatment was somewhat surprising given previous observations (e.g., Hanson et al., 2013). It is possible that our decision to specifically include patients with greater clinical needs may have led to a selection of patients being less responsive to standard treatment. When BA was added gradual improvements were visible for all participants except one (P4) on self-reported depressive symptoms. The pattern was confirmed by clinician ratings and strong effect sizes in four participants using NAP statistics. The hourly diary ratings of mood in the current study also displayed gradual improvement but it is important to note that there appeared to be considerable overlap between hourly mood ratings over the baseline and BA phases and effects were less pronounced than for daily measures.

Taken together our outcomes support the promising inpatient BA findings previously reported by Hopko et al. (2003). However, we did include a wider range of measures and a more diagnostically heterogeneous patient population than did Hopko et al. (2003). Gollan et al. (2014), similar to us, studied BA for a heterogeneous inpatient population. They however failed to find a significant difference between BA and standard treatment on psychiatric symptoms. The BA protocol used by Gollan et al. (2014) and by us differed in format and inclusion criteria.

Measures of change in process over the course of therapy are crucial to demonstrate the proposed mechanisms of a therapy. Assessment with BA-specific measures, the CUB and BADS-SF, indicated stable baselines as only P4 evidenced a temporary change. After BA was initiated approach behaviors increased gradually (in five of six participants) and avoidance decreased (in four of six participants). Overall the NAP analyses confirmed these results. Hourly diary ratings of engagement in activity also indicated increased levels of activation except in the case of P4. These findings indicate that activation increased and avoidance decreased following the initiation of BA in four or five participants. Thus, our findings replicate those of Gaynor and Harris (2008) where onset of BA was associated with substantial changes in activation for three of four participants. Our findings are also in line with those of Gollan et al. (2014) except they did not observe significant differences between BA and standard treatment on CUB avoidance.

The current study investigated the temporal relation between process and outcome. This is often recognized as a crucial research question and equally often reported to be a challenging task (Dimidjian et al., 2011; Gaynor & Harris, 2008; Manos et al., 2010). We included both daily and hourly measures to increase the likelihood of discovering such patterns. This strategy yielded mixed results. Changes in activation and avoidance, using CUB, either preceded or changed concurrently with depressive symptoms. In line with previous research (Gaynor & Harris, 2008; Manos et al., 2011) changes in activation preceded improvements in depression in half of the participants. However, when investigating the hourly diary ratings results were more equivocal. Hourly changes in mood at several instances appeared to precede changes in activation. Manos et al. (2010) pointed out that measuring the relation between activation/avoidance and mood is complicated by the great variability in the timing of changes allowed for theoretically by the BA model. A change in activation can have instant effects on mood if natural reinforcement is immediate, and have a significantly delayed effect on mood if the activity requires repetition or gradual steps towards reinforcement. Likewise, there is nothing in the BA model that suggests that change in mood cannot precede change in behavior; rather, the BA model simply states that it may be more efficient therapeutically to target change in behavior rather than change in mood. Thus our mixed results may reflect true differences in temporal patterns when studying different time lags. The mixed results may also be related to differences in measurement characteristics. The CUB scales include items that pinpoint specific activation and avoidance behaviors that are hypothesized to have a large impact on mood. The hourly diary measure, on the other hand, only asked participants to rate to what degree they were engaged in a pleasant or important activity the previous hour. Thus the hourly measure does not explicitly ask participants about the most central activities and avoidance behaviors, rather they were asked to rate all waking hours regardless of if they were merely waiting for the ward psychiatrist appointment or being weighed by the ward nurse. In fact, previous research shows that different change patterns are discovered with different measures. Collado et al. (2014) used weekly assessments of depressive symptoms along with an activation and an environmental reward measure. Improvement in depression was concurrent with increased activation and was preceded by increased environmental reward.

This study had several methodological limitations. In terms of the study population, we did not include some diagnostic groups that are relatively common in acute inpatient care (e.g., acute psychosis and primary eating disorders). Another possible critique is that we enrolled few of the screened patients (6 of 55). However, only $n = 10$ were non-eligible due to patient characteristics. The remaining were non-eligible because their treatment situation risked violating research (rather than treatment) procedures. Thus, in routine care these patients would be equally eligible for BA

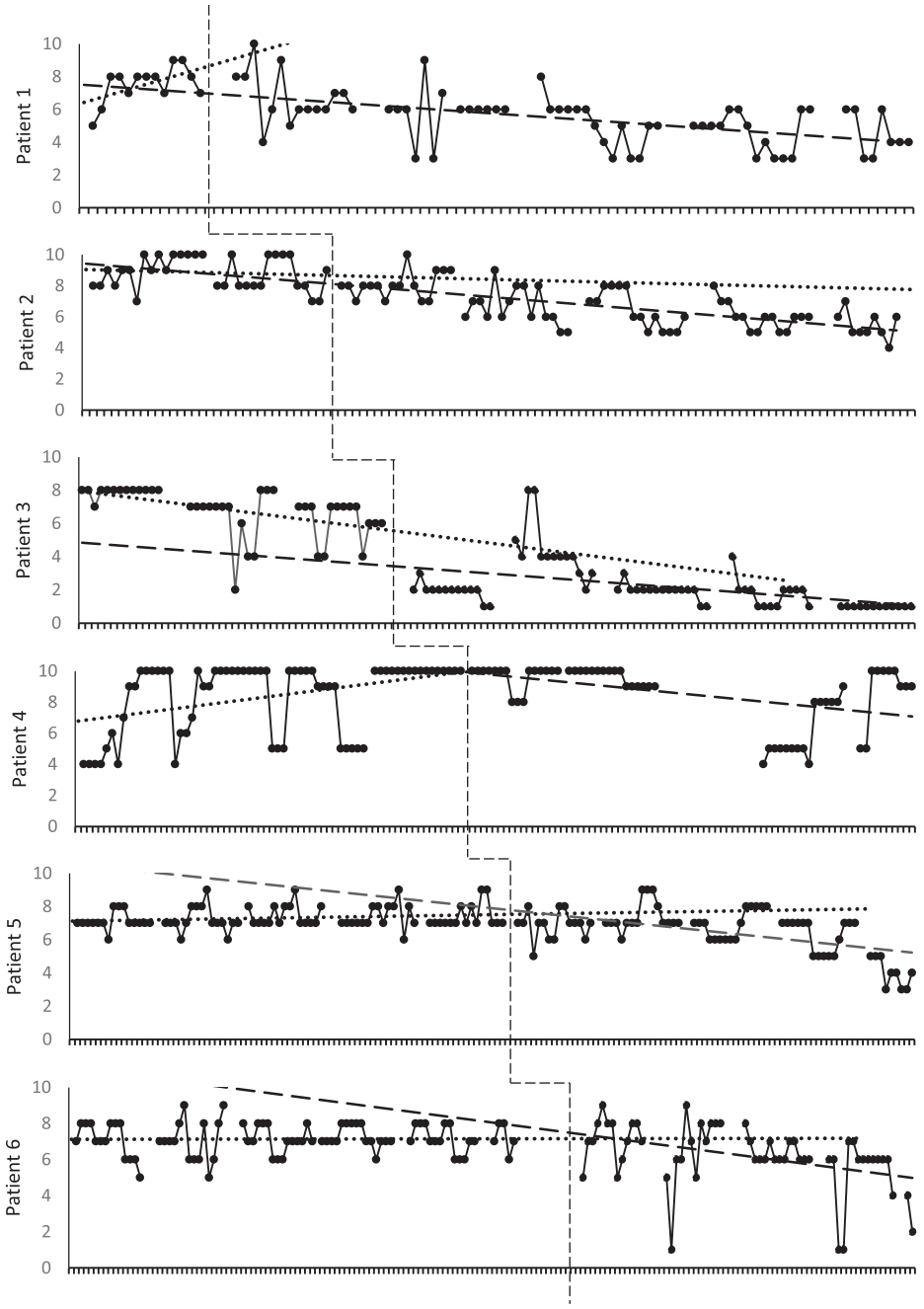

Fig. 3. Hourly diary ratings of mood for participants 1 to 6. Mood is rated from 1 to 10 with higher scores indicating more depressive mood. The end of baseline is indicated by the vertical line. Ordinary least square trend-lines indicate slopes. Dotted lines indicate baseline trend-lines. Dashed lines indicate trend-lines during Behavioral Activation.

treatment. The particular design employed in our study also had significant limitations. Our multiple baseline design did control for possible time effects but was less apt at answering questions about the causal effects of specific BA-components. Also, it is important to note that the increased attention that occurred with the BA intervention could have caused the improvements. On a related note, the lack of fidelity checking further hampers our ability to draw conclusions about mechanisms. Without controlling the therapist competence one cannot, with certainty, state that components were delivered with integrity. Furthermore, the differential effects of the multitude of simultaneous interventions at work in this study is inherently difficult to disentangle. In fact, all six participants were prescribed multiple concurrent medical treatments and dosages were adjusted on a day-to-day basis. Also, nursing interventions on the wards are not standardized and it is possible they varied over time and across participants. However, it was neither possible nor ethical to restrict medical regimes or to standardize nursing in the acute study setting. Another limitation was the lack of long-term assessments. Follow-up is complicated by unpredictable timing of discharge and also the great differences in the quality and intensity of aftercare that inpatients receive after discharge. A last significant limitation concerns assessments. Outcome ratings were not completed by research team members or by individuals invested in the BA model, but raters were neither blind nor uninvolved in the care of our participants. We considered using blind clinical ratings but it was not possible for practical

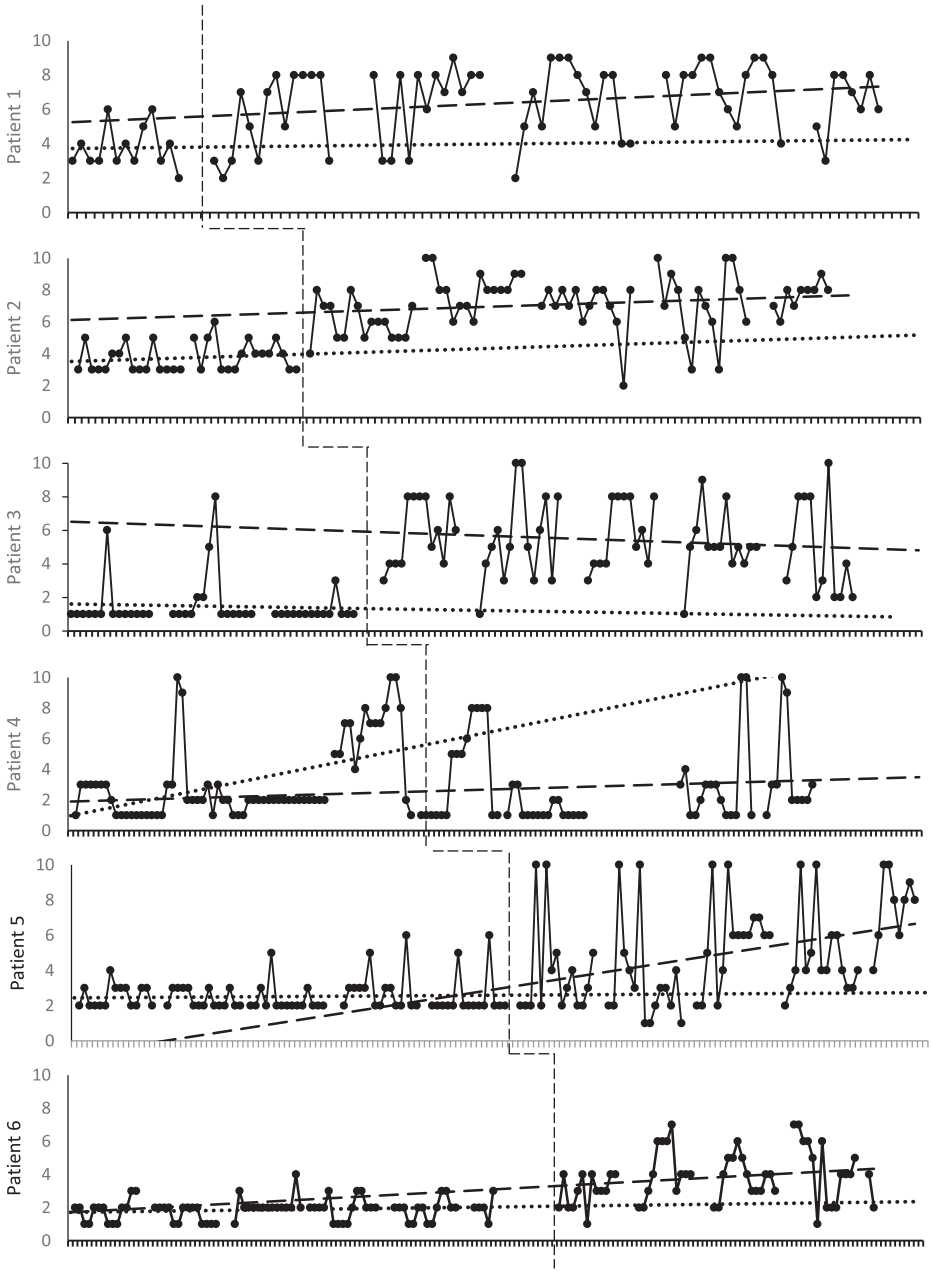

Fig. 4. Hourly diary ratings of engagement in activity for participants 1 to 6. Activation is rated from 1 to 10 with higher scores indicating greater engagement in activity. The end of baseline is indicated by the vertical line. Ordinary least square trend-lines indicate slopes. Dotted lines indicate baseline trend-lines. Dashed lines indicate trend-lines during Behavioral Activation.

reasons and furthermore we thought staff and psychiatrists working on the ward had the advantage of a more detailed knowledge about the participants' clinical status. Also related to measures, we included patients with a variety of psychiatric diagnoses but we did not use measures that captured all those clinical problem areas. Adding measures to the protocol would have risked overwhelming participants. Instead we focused on the depressive symptoms and included some global clinician ratings. The measures were also chosen on the basis of being part of the routine assessments at the clinic and were thus familiar to clinicians.

Despite limitations the current study provides valuable contributions to the scarce inpatient psychotherapy literature. Cuijpers et al. (2011) reported in a meta-analysis that only one in six inpatients with depressive disorders were expected to experience added benefits by adding psychotherapy to the inpatient setting. The findings in our study clearly offer a more optimistic picture with four or possibly five improved patients. Clinicians working in acute inpatient settings may be particularly interested in the promising findings regarding suicidal ideation as well as the feasibility indicated by both patients and staff. Our BA mechanism findings largely replicate those of previous studies (Gaynor & Harris, 2008; Gollan et al., 2014; Manos et al., 2011). Such consistent findings across different populations, treatment durations and settings provide support for continued research on the role of activation and avoidance in depression treatment. The somewhat different results obtained with different process measures in both our and other studies (Collado et al., 2014) underscore the need for using a variety of measures and for continued process measure

Table 5
The significant and the strongest non-significant correlations on daily measures.

		Cross-lagged correlation
P1	CUB-app. & MADRS-S	LAG 0: $r = -0.95$ $p = 0.002$
	CUB-Avo & MADRS-S	LAG 0: $r = +0.81$ (n.s)
P2	CUB-app. & MADRS-S	LAG +01: $r = -0.83$ $p = 0.004$
	CUB-Avo & MADRS-S	LAG 0: $r = +0.81$ (n.s.)
P3	CUB-app. & MADRS-S	LAG +01: $r = -0.68$ (n.s.)
	CUB-Avo & MADRS-S	LAG 0: $r = +0.96$ $p = 0.000$
P4	CUB-app. & MADRS-S	LAG +03: $r = -0.40$ (n.s.)
	CUB-Avo & MADRS-S	LAG +02: $r = +0.75$ $p = 0.004$
P5	CUB-app. & MADRS-S	LAG 0: $r = -0.72$ (n.s.)
	CUB-Avo & MADRS-S	LAG 0: $r = +0.72$ (n.s.)
P6	CUB-app. & MADRS-S	LAG +01: $r = -0.75$ $p = 0.003$
	CUB-Avo & MADRS-S	LAG 0: $r = +0.95$ $p = 0.000$

Note: MADRS-S = Mongomery-Asberg Depression Rating Scale Self rating version; CUB-App = Checklist of Unit Behavior (the approach sub-scale); CUB-Avo = Checklist of Unit Behavior (the avoidance sub-scale). LAG = Cross-lagged correlations. A "0" indicates a concurrent correlation between the two measures. Positive lags suggest that first measure precedes change in the other.

development. Given the prevailing passivity and social disengagement on inpatient wards (Sharac et al., 2010) the observed changes in activation and avoidance are also of great interest in their own right, regardless of symptom improvement. Taken together, the promising findings provide encouragement for proceeding with RCTs. Future studies should utilize relevant control conditions. Such controls should be time matched and provide the non-specific factors of psychotherapy (e.g., attention, support, etc.) in a manner that is perceived as credible by participants. Without high quality control conditions there is a marked risk for overestimation of treatment effect (Cuijpers, van Straten, Bohlmeijer, Hollon, & Andersson, 2010). Future studies should also include long-term follow up with patients several months after discharge in order to assess relapse and re-admission.

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