Psychological Medicine

cambridge.org/psm

Predictors of affect following discharge from partial hospitalization: a two-week ecological momentary assessment study

Marie Forgeard[1,2,3], Courtney Beard[1,2], Danielle Shayani[1], Alexandra L. Silverman[1,4], Eli Tsukayama[5] and Thröstur Björgvinsson[1,2]

[1]McLean Hospital, 115 Mill Street, Belmont, MA, 02468, USA; [2]Harvard Medical School, Boston, MA, 02115, USA; [3]William James College, Newton, MA, 02459, USA; [4]University of Virginia, Charlottesville, VA, 22904, USA and [5]University of Hawaii West Oahu, Kapolei, HI, 96707, USA

Original Article

Cite this article: Forgeard M, Beard C, Shayani D, Silverman AL, Tsukayama E, Björgvinsson T (2021). Predictors of affect following discharge from partial hospitalization: a two-week ecological momentary assessment study. *Psychological Medicine* **51**, 1157–1165. https://doi.org/10.1017/S0033291719004057

Received: 13 March 2019
Revised: 12 August 2019
Accepted: 20 December 2019
First published online: 3 February 2020

Key words:
Affect; ecological momentary assessment; partial hospitalization

Author for correspondence:
Marie Forgeard, E-mail: mforgeard@mclean.harvard.edu

Abstract

Background. Little is known about the everyday experiences of individuals transitioning from acute to outpatient psychiatric care, an important period of risk for mood symptom relapse. This study used ecological momentary assessment (EMA) to examine whether specific daily experiences were related to momentary affective states following discharge from a partial hospitalization program (PHP).

Methods. A sample of 114 adults (M_{age} = 36 years old, 52% female, 83% White) completed four brief EMA surveys every day for 2 weeks assessing intensity/type of stressful events and social contact, as well as positive/negative affect (PA/NA). Half of participants reported therapeutic skills use.

Results. Stress severity ratings prospectively predicted increased NA. NA predicted spending less time with close relationships. However, interacting with close relationships predicted increased positive affect (PA). Finally, PA predicted spending time with more people. The use of two skills (behavioral activation and interpersonal effectiveness) was concurrently, but not prospectively, associated with improved affect.

Conclusions. Examining daily experiences of individuals discharging from partial hospitalization provides important information about factors that may influence affective states during the transition from acute to outpatient care. Findings from this study can be used to help prepare patients for discharge and develop interventions for the post-acute period.

Partial hospitalization programs (PHPs), which offer a crucial intermediate level of treatment for individuals referred from either outpatient or inpatient settings, are effective in reducing acute mood symptoms; however, residual symptoms at discharge are common and may put individuals at higher risk for relapse (Björgvinsson et al., 2014; Kallert et al., 2007). Indeed, many individuals will end up being re-hospitalized within 2 years (with readmission rates ranging from 10–50% depending on populations studied; Marshall, Crowther, Sledge, Rathbone, & Soares-Weiser, 2011). The highest risk of relapse occurs in the first weeks following the end of acute care (Vigod et al., 2013). Patients typically experience the transition from the highly structured and supportive environment provided by PHPs to unstructured daily life as challenging/abrupt and may have difficulty following up on outpatient treatment recommendations (Boyer, McAlpine, Pottick, & Olfson, 2000; Larivière, Desrosiers, Tousignant, & Boyer, 2010; Steffen, Kösters, Becker, & Puschner, 2009). Therefore, investigating how people fare in everyday life *immediately* after treatment ends – an important but understudied transition period – may be useful. Research examining everyday life experiences of recently discharged individuals can help identify contextual (e.g. life stress, social contact) and individual (e.g. behaviors) factors associated with improved mood (Johnson, Lundström, Åberg-Wistedt, & Mathé, 2003; Kessler, Kendler, Heath, Neale, & Eaves, 1992; Lethbridge & Allen, 2008; Paykel, 1994).[1†] Such research however requires the use of methods designed to reliably capture relevant day-to-day experiences in real-world contexts. The present study used ecological momentary assessment (EMA) to examine predictors of momentary affect during the 2 weeks following discharge from a PHP. EMA consists of repeated assessments designed to capture individuals' current (or very recent) thoughts, feelings, and behaviors in real-time and real-world environments, minimizing biases associated with retrospective memory recall and maximizing ecological validity (Ebner-Priemer & Trull, 2009; Shiffman, Stone, & Hufford, 2008). We specifically examined the dynamic role of stressful events, social interactions, and therapeutic skills use in momentary positive affect (PA) and negative affect (NA) following discharge.

In nonclinical samples, experimental and EMA studies have shown that stress predicts increased NA, especially for older individuals and those high in neuroticism (e.g. Mroczek

†The notes appear after the main text.

CAMBRIDGE UNIVERSITY PRESS

& Almeida, 2004; Suls, Green, & Hillis, 1998; Zautra, Reich, Davis, Potter, & Nicolson, 2000; for a review see Finan, Zautra, & Wershba, 2011). In clinical samples, EMA studies have shown that individuals with depressive disorders experience less PA and more NA throughout the day than controls in general as well as in response to stressful events (aan het Rot, Hogenelst, & Schoevers, 2012; Bylsma, Taylor-Clift, & Rottenberg, 2011; van der Stouwe *et al.*, 2019; Wichers et al., 2007). Thus, we hypothesized that higher momentary stress levels would predict lower PA and higher NA in the post-discharge period from a PHP.

Additionally, social isolation and/or conflict predicts deteriorated affect (Fuller-Tyszkiewicz, Karvounis, Pemberton, Hartley-Clark, & Richardson, 2017; Pemberton & Fuller Tyszkiewicz, 2016; Snippe et al., 2016; Vranceanu, Gallo, & Bogart, 2009). For example, Brown, Strauman, Barrantes-Vidal, Silvia, and Kwapil (2011) found that in a young adult sample, social isolation was associated with NA and depressive symptoms, whereas spending time with close ones was associated with improved affect. We therefore hypothesized that social contact, especially spending time with close ones, would predict improved affect (higher PA/lower NA) in our sample.

Finally, little evidence to date speaks to the immediate effects of therapeutic skills use in mood recovery. Adherence and engagement with skills practice typically predict enhanced treatment outcomes (Conklin & Strunk, 2015; Kazantzis, Whittington, & Dattilio, 2010), but this is generally only assessed using retrospective reports from patients or therapists (e.g. at the end of treatment, or since the last session) (Kazantzis, Deane, & Ronan, 2004; Kazantzis, Brownfield, Mosely, Usatoff, & Flighty, 2017). Nonetheless, in a randomized controlled trial, Hoet, Burgin, Eddington, and Silvia (2018) assessed skills use twice a week using a phone-based system and found that on days on which participants reported greater use of therapeutic skills, they also reported improved mood and functioning. Thus, we hypothesized that therapeutic skills use would predict improved affect (higher PA/lower NA) in our sample.

The present study

The present study is (to the best of our knowledge) the first to use EMA to examine the daily experiences of individuals discharging from partial hospitalization, a transition that is typically experienced as challenging and presents significant risk for symptom relapse. This study assessed three main predictors of momentary PA and NA (stressful events, social contact, and therapeutic skills use) during a period of 2 weeks. Participants also provided daily depressive symptom reports. Based on previous findings in the literature, we tested the following hypotheses and exploratory aims: (a) lower momentary stress severity will be associated with higher PA and lower NA (we also explored whether stressor type mattered), (b) social contact (in particular, spending time with close ones) will be associated with higher PA and lower NA, and (c) using therapeutic skills will be associated with higher PA and lower NA (we also explored whether skill type mattered).

Method

Setting

Participants were recruited from a PHP located in a non-profit, private psychiatric hospital in New England. The PHP delivers group and individual therapy to patients experiencing a wide range of psychiatric conditions (primarily mood, anxiety, personality, and psychotic disorders). Treatment focuses on learning and practicing core cognitive-behavioral skills (CBT; Beck, Rush, Shaw, & Emery, 1979) such as behavioral activation and cognitive restructuring, as well as core dialectical behavior therapy skills (DBT; Linehan, 1993) such as mindfulness, distress tolerance, emotion regulation, and interpersonal effectiveness. In addition to individual and group therapy, patients work with a case manager and psychiatrist, who together coordinate treatment with other members of the treatment team including psychologists, nurses, counselors, and trainees. Treatment is tailored to the needs of each individual patient. Depending on symptom presentation, treatment may primarily focus on CBT or DBT skills, but most commonly integrates components of both modalities (for a review of the treatment approach, see Forgeard, Beard, Kirakosian, & Björgvinsson, 2018). Participants in this study received an average of 10.1 treatment days (S.D. = 1.4) at the PHP before discharge.

Participants

Participants were recruited via flyers and in person by a research assistant during their stay in the PHP between December 2016 and July 2017 (see Fig. 1 for a CONSORT diagram of participant flow including criteria for exclusion). A total of 114 individuals participated in the study. Prior to discharge from the PHP, participants met with the research assistant for a 30-min orientation session to review all procedures, download the smartphone app used in this study, and practice completing surveys.

The 114 participants were 36 years old on average (S.D. = 14, range = 19–70). Most reported their ethnicity/race as White and non-Latinx (83%); about half (52%) reported their gender as female; 40% had been hospitalized for psychiatric reasons during the past 6 months. The most common current diagnosis in this sample was a major depressive episode in the context of major depressive disorder (68% of the sample) and most participants (69%) met criteria for two or more disorders (see Tables 1 and 2 for more detailed information).

Materials and procedures

Participants completed surveys using *MetricWire*, a secure HIPAA-compliant smartphone app. All participants provided informed written consent for the study. All materials and procedures were reviewed and approved by the local Institutional Review Board.

EMA surveys

Participants completed EMA surveys four times a day for 14 days, at semi-random intervals between 10 am and 8 pm (separated by at least 2 h). Participants had up to an hour to answer each survey[2] (see online Supplementary Materials for all EMA items).

Positive/negative affect (*PA/NA*). Participants reported how they felt right before they received the notification using six PA adjectives and six NA adjectives, on a 7-point Likert scale from 1 (*not at all*) to 7 (*extremely*). The adjectives were selected from existing self-report measures and previous EMA studies examining momentary affect (e.g. Bylsma & Rottenberg, 2011; Peeters, Berkhof, Rottenberg, & Nicolson, 2010; Watson, Clark, & Tellegen, 1988). However, we modified existing scales for brevity (as the use of longer scales such as the PANAS was not feasible),

https://doi.org/10.1017/S0033291719004057 Published online by Cambridge University Press

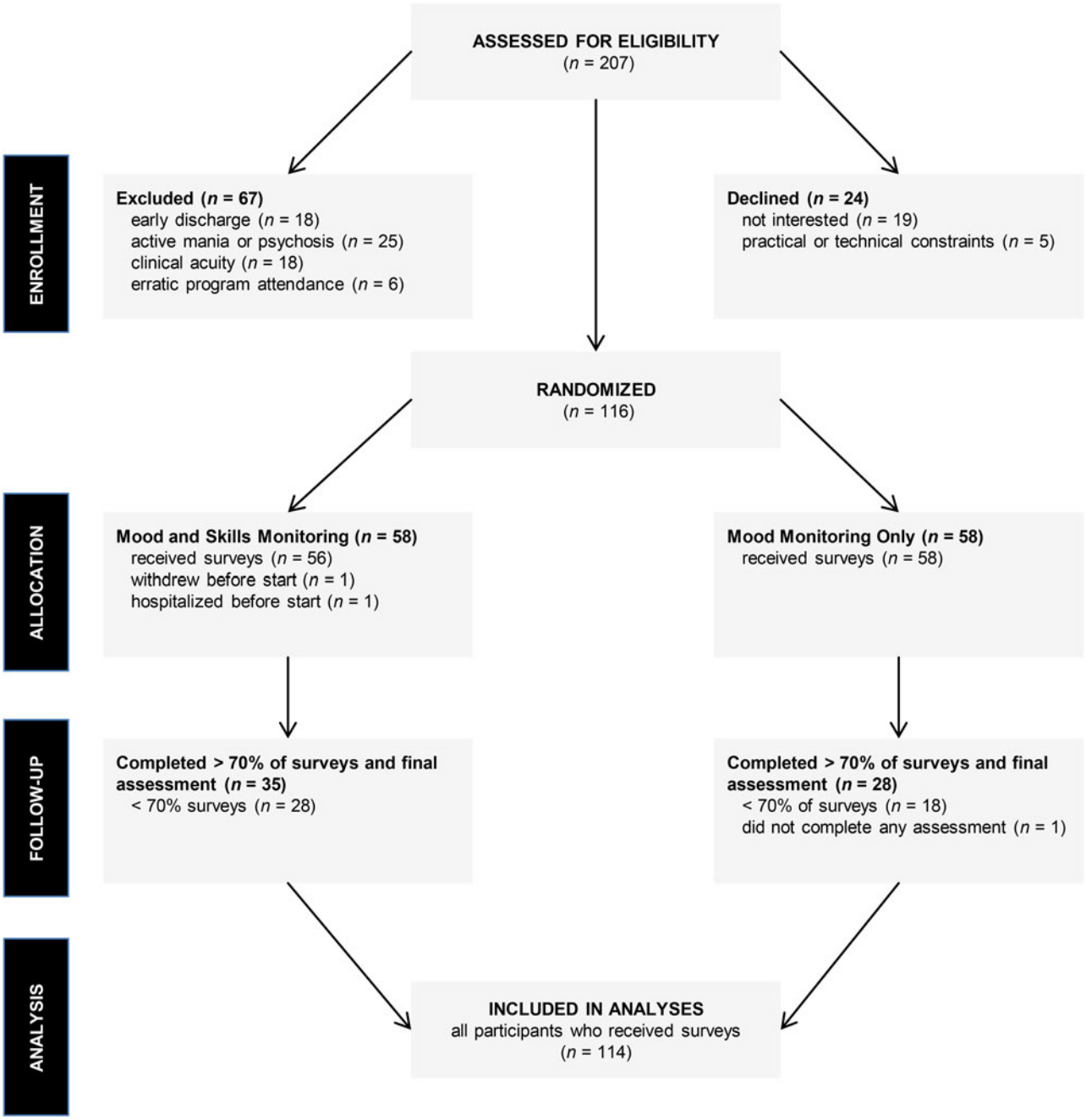

Fig. 1. CONSORT diagram detailing recruitment and enrollment of participants, as well as information about allocation of participants to group (mood and skills monitoring *v.* mood monitoring only), follow-up (whether participants completed >70% of surveys), and inclusion in statistical analyses.

and to include an equal number of activated (i.e. 'excited,' 'energized,' 'active'), and deactivated (i.e. 'calm,' 'peaceful,' 'relaxed') PA states, as well as activated (i.e. 'frustrated,' 'angry,' 'nervous') and deactivated ('bored,' 'sad,' 'tired') NA states. Because traditional estimates of reliability are not appropriate for use in multilevel data such as the EMA reports collected in this study, we used a multilevel approach to examine reliability of the PA and NA scales used in the EMA surveys (Geldhof, Preacher, & Zyphur, 2014; Nezlek, 2007; Nezlek & Gable, 2001). Both estimates of between-person reliability (PA = 0.94, NA = 0.91) and within-person reliability (PA = 0.75, NA = 0.70) confirmed that these scales had adequate internal consistency.

Social contact and relationship type(*s*). Participants indicated how many people they were interacting with right before they received the notification using a 10-point dropdown menu (with 10 corresponding to 10 or more people) and selected relationship types using a checklist. We recoded relationship type into two binary variables for analyses (since multiple relationship types could be selected): *close relationships* (i.e. friends, romantic partners, or adult and child relatives) and *non-close relationships* (i.e. acquaintances, coworkers, strangers, or others).

Stressor severity and stressor type(*s*). Participants indicated whether they experienced a stressful event since the last notification. If they answered yes, they rated how stressful the event

https://doi.org/10.1017/S0033291719004057 Published online by Cambridge University Press

Table 1. Demographic characteristics for the sample ($N = 114$)

	N	(%)
Gender		
Female	59	(51.8)
Male	54	(47.4)
Non-binary or genderfluid	1	(0.9)
Ethnicity/race		
African American	2	(1.8)
Asian	9	(7.9)
Multiracial	8	(7.0)
White	95	(83.3)
Sexual orientation		
Bisexual	9	(7.9)
Gay/lesbian	7	(6.1)
Heterosexual/straight	95	(83.3)
Queer	1	(0.9)
Not listed	2	(1.8)
Sexual minority	19	(16.7)
Education		
High school graduate or less	4	(3.5)
Some college	41	(36.0)
College graduate	38	(33.3)
Post-college education	31	(27.2)
Employment		
Not employed	54	(47.4)
Employed full-time	44	(38.6)
Employed part-time	16	(14.0)
Marital status		
Never married	67	(58.8)
Married or living with partner	34	(29.8)
Separated/divorced or widowed	13	(11.4)
Psychiatric hospitalization (last 6 months)	46	(40.4)
Age (*M*, S.D.)	35.96	(14.4)

Table 2. Clinical characteristics for the sample ($N = 114$)

Clinical characteristics	*N*	(%)
Current diagnosis		
MDE with MDD	77	(67.5)
MDE within bipolar disorder	9	(7.9)
Generalized anxiety disorder	61	(53.5)
Social anxiety disorder	41	(36.0)
Obsessive-compulsive disorder	27	(23.7)
Panic disorder	23	(20.2)
Post-traumatic stress disorder	17	(14.9)
Alcohol dependence or abuse	17	(14.9)
Missing	6	(5.3)
Number of diagnoses		
0	5	(4.4)
1	24	(21.1)
2	28	(24.6)
3	27	(23.7)
4	13	(11.4)
5	8	(7.0)
6	2	(1.8)
7	1	(0.9)
Missing	6	(5.3)

MDE, major depressive episode; MDD, major depressive disorder.
Diagnoses were established using the Mini International Neuropsychiatric Interview for DSM-IV-TR (MINI; Sheehan et al., 1998). Participants completed the MINI with a clinician at the beginning of treatment in the PHP (typically on their second day of treatment). The MINI has strong reliability and validity in relation to the Structured Clinical Interview for DSM-IV (SCID-IV), with inter-rater reliabilities ranging from kappas of 0.89–1.0 (Sheehan et al., 1998). In this study, the MINI was administered by doctoral practicum students and interns in clinical psychology who received weekly supervision by a postdoctoral fellow. Training included reviewing administration manuals and completing mock interviews, as well as participating in bi-annual reliability ratings.

was from 1 (*mildly*) to 5 (*extremely*). A rating of 0 was entered when participants reported no recent stressor. They also indicated the type of stressful event experienced using a checklist. We recoded stressor type into two binary variables for analyses (since multiple stressor types could be selected): *external stressors* due to outside circumstances (i.e. interpersonal, financial, daily living, work-, school-, housing-related, or other) and *internal stressors* due to personal health factors (i.e. physical or mental health-related). Participants who experienced more than one stressful event since the last notification were prompted to base their answer on the most stressful event they experienced.

Skills use. Finally, half of participants indicated which skills they used since the last notification using a checklist of CBT and DBT skills. The skills listed form the basis of treatment PHP and we therefore expected that participants would be familiar with them. However, participants had access to very brief descriptions of each skill on the app for reference. We randomly assigned half of participants not to answer these items because answering questions about skills use could plausibly impart additional benefits and thus constitute an active intervention. Although we did not expect that such additional benefits would occur because participants did not receive any additional prompting to use skills in this very simple checklist, we still wanted to be able to compare individuals who did and did not answer this module to ensure that this component of surveys did not influence outcomes.

Daily depressive symptom measure

Participants completed the Patient Health Questionnaire-9 (PHQ; Kroenke & Spitzer, 2002) to assess depressive symptoms over the past 24 h between 6 am–11 am every day for 14 days (participants had also completed this measure daily during the PHP). Participants were instructed to complete this measure as early as possible after waking up. Response anchors range from 0 (*not at all*) to 3 (*nearly all the time*). The PHQ-9 had high internal consistency in this study (day 1 $\alpha = 0.80$). To encourage

https://doi.org/10.1017/S0033291719004057 Published online by Cambridge University Press

participation, participants viewed their PHQ-9 score every morning along with interpretation guidelines.

Compensation

Participants received $20 per week for completing any survey, with an additional $30 per week for completing at least 80% of surveys (up to $100 in total).

Data analytic strategy

We conducted analyses using SPSS 24 and Mplus 8 (Muthén & Muthén, 2017).

Group comparisons

We examined whether answering questions about skills use was associated with different rates of survey completion using one-way ANOVAs. We also assessed whether groups differed on demographic or diagnostic characteristics as well as symptom severity at baseline. Finally, we used growth curve modeling (Grimm, Ram, & Estabrook, 2017) to verify that tracking skills did not impart additional benefits.

Preliminary analyses

We provide descriptive information about the percentage of surveys completed by participants. We also assessed whether demographic or diagnostic characteristics, as well as symptom severity on day 1 of the study were associated with survey completion using one-way ANOVAs and correlations.

Momentary predictors of positive/negative affect

Multilevel models tested whether momentary stress, social contact, and skills use related to PA and NA at each time point (concurrent analyses), as well as whether they also prospectively predicted PA and NA at the next time point, and vice-versa (lagged analyses). In addition to examining p-values and unstandardized B coefficients, we manually computed standardized β coefficients to aid with interpretation. In preparation for multilevel models, power analyses (as described by Bickel, 2007) showed that the required r to detect within-person effects of predictors on both PA and NA ($n = 112$) was 0.20. For skills ($n = 55$), the required r was 0.28. In other words, using a two-tailed α of 0.05, we had 80% power to detect small-to-medium within-person effects.

Results

Group comparisons

Groups did not differ on any baseline variables or the percentage of daily symptom surveys completed (all ps > 0.05). However, participants who tracked skills use completed more EMA surveys ($M = 71\%$, S.D. = 23, $n = 55$) than those who did not ($M = 60\%$, S.D. = 30, $n = 57$), $F(1, 112) = 4.54$, $p = 0.035$, Cohen's $d = 0.40$. Growth models showed that participants across groups overall experienced a small and decelerating increase in depressive symptoms after discharge as indicated by significant means for intercept ($B = 7.30$, S.E. = 0.49, $p < 0.001$), slope ($B = 0.30$, S.E. = 0.12, $p = 0.01$), and quadratic terms ($B = -0.02$, S.E. = 0.01, $p = 0.02$). Multiple group growth models confirmed that trajectories did not differ based on whether participants tracked skills use, $\Delta\chi^2$ (9) = 4.20, $p = 0.90$. Thus, we collapsed groups for our main analyses (see Table 3 for more information about these analyses).

Preliminary analyses

On average, participants completed 65% of EMA surveys (S.D. = 27, median = 75%) and 79% of daily symptom surveys (S.D. = 26, median = 89%). Age was correlated with the percentage of daily symptom surveys completed ($r = 0.27$, $p = 0.004$). No other baseline or diagnostic variables were associated with the percentage of EMA or daily symptom surveys completed (all ps > 0.05). Table 4 provides information about types of stressors, relationships, and skills use reported by participants.

Concurrent associations between stress, social contact, skills, and affect

Stress and social contact (n = 112)

We built two multilevel models (using full information likelihood with robust standard errors) that included the following Level 1 within-person predictors of current PA or NA: *recent stressor severity* (0–5), *recent internal stressor* (binary), *recent external stressor* (binary), *current social contact* (number of individuals the participant was with), *current close relationship* (binary), and *current non-close relationship* (binary). As explained under Method, stressor and relationship types were not mutually exclusive, which is why we included two binary variables for each. All within person-predictors were person-centered, and the within-person slopes were allowed to vary between people (i.e. treated as random). At Level 2, we allowed all random slopes to covary. We also regressed the outcome on the between-person means of the within-person predictors. All between-person predictors were grand-mean centered. As a starting point, these concurrent models only examined associations between predictors and affect at the same time point (thus, they did not control for affect at the previous time point, a limitation addressed by lagged analyses).

Concurrent models showed that recent stressor severity was associated with lower PA ($B = -0.16$, S.E. = 0.03, $\beta = -0.14$, $p < 0.001$) and higher NA ($B = 0.25$, S.E. = 0.03, $\beta = 0.22$, $p < 0.001$). Being with close relationships was associated with higher PA ($B = 0.23$, S.E. = 0.04, $\beta = 0.10$, $p < 0.001$) and lower NA ($B = -0.18$, S.E. = 0.03, $\beta = -0.07$, $p < 0.001$). Social contact was associated with higher PA ($B = 0.02$, S.E. = 0.01, $\beta = 0.04$, $p = 0.02$)[3]. None of the other within-person predictors were significant (all ps > 0.05; see online Supplementary Materials).

Skills use (n = 55)

We used the same approach to model concurrent relationships between recent use of three CBT (behavioral activation, exposure, and cognitive restructuring) as well as four DBT (mindfulness, distress tolerance, emotion regulation, and interpersonal effectiveness) skills since the last notification and PA/NA. The recent use of behavioral activation ($B = 0.15$, S.E. = 0.05, $\beta = 0.05$, $p = 0.004$) and interpersonal effectiveness ($B = 0.25$, S.E. = 0.06, $\beta = 0.07$, $p < 0.001$) were associated with higher PA, whereas the recent use of distress tolerance was associated with both lower PA ($B = -0.21$, S.E. = 0.09, $\beta = -0.04$, $p = 0.03$) and higher NA ($B = 0.28$, S.E. = 0.13, $\beta = 0.06$, $p = 0.02$). None of the other within-person predictors were significant (all ps > 0.05; see online Supplementary Materials).

Lagged associations between stress, social contact, skills, and affect

Stress and social contact (n = 112)

We built two cross-lagged models to determine whether stress and social contact at one time point (t) predicted PA or NA at the

https://doi.org/10.1017/S0033291719004057 Published online by Cambridge University Press

Table 3. Fit statistics for growth models characterizing depressive symptom trajectories, across the full sample and comparing participants who did or did not track skills use

	AIC	ABIC	df	χ^2	RMSEA	CFI	SRMR
Models across full sample							
No growth	6478	6471	103	341.791***	0.144	0.794	0.100
Linear growth	6343	6335	100	223.795***	0.105	0.893	0.100
Quadratic growth	6284	6273	96	158.952***	0.077	0.946	0.064
Multiple group models with quadratic growth model							
Unconstrained	6301	6281	192	367.148***	0.128	0.888	0.084
Constrained	6288	6272	201	369.908***	0.122	0.888	0.103
χ^2 difference test (Δ)			9	4.200^{ns}			

AIC, Akaike Information Criterion; ABIC, sample size adjusted Bayesian Information Criterion; RMSEA, Root Mean Square Error of Approximation; CFI, Comparative Fit Index; SRMR, Standardized Root Mean Squared Residual.
We concluded that a quadratic growth model best described changes in PHQ-9 scores across the full sample based on lower AIC and sample-size adjusted BIC values and appropriate values for other fit statistics (RMSEA = or <0.08, CFI = or >0.90, SRMR = or <0.08; see Hu & Bentler, 1999; Kline, 2005). We confirmed that trajectories did not differ between groups by comparing the fit of a constrained model (in which the means, variances, and covariances of the intercept, slope, and quadratic terms were set to be equal) to that of an unconstrained model (in which these freely varied by group).
***$p < 0.001$, ^{ns} = not significant.

next time point ($t + 1$) (and vice-versa) while controlling for associations between each variable and itself at the next time point (autoregressions). To reduce model complexity, we restricted our model to the significant within-person relationships found in the concurrent models reported above. To do this, we specified three sets of paths. First, each variable at time t predicted itself at time $t + 1$. Second, variables at time t predicted PA/NA at time $t + 1$. Third, we included the reverse relationships with PA/NA at time t predicting the same variables at time $t + 1$. We used the LAGGED function in MPlus version 8 (Muthén & Muthén, 2017) to conduct analyses using dynamic structural equation modeling (Asparouhov, Hamaker, & Muthén, 2018), specifying the time interval (from t to $t + 1$) as 0.10 (which corresponds to 2.4 h, approximately the average amount of time between administration of daily EMA surveys in this study). Analyses used Bayesian estimation with 2000 iterations; person-mean centering was accomplished as part of model estimation. Again, between-person predictors were grand mean centered and each outcome was regressed onto the between-person means of the within-person predictors at Level 2. In addition, all variables and random slopes were free to covary.

Being with a close relationship at time t predicted increased PA at time $t + 1$ ($B = 0.14$, posterior S.D. = 0.05, $\beta = 0.06$, $p = 0.004$). PA at time t predicted social contact at time $t + 1$ ($B = 0.34$, posterior S.D. = 0.12, $\beta = 0.17$, $p = 0.004$). Recent stressor severity predicted NA at time $t + 1$ ($B = 0.06$, posterior S.D. = 0.02, $\beta = 0.05$, $p = 0.02$). NA at time t also predicted a lower likelihood of being with a close relationship at time $t + 1$ ($B = -0.03$, posterior S.D. = 0.02, $\beta = -0.07$, $p = 0.04$). None of the other within-person relationships were significant (all ps > 0.05; see online Supplementary Materials).

Skills use (n = 55)

We repeated the same models for skills use, again restricting our model to the significant within-person relationships found in the concurrent models (by only including behavioral activation, interpersonal effectiveness, and distress tolerance in the PA model, and distress tolerance only in the NA model). None of the lagged associations were significant (all ps > 0.05; see online Supplementary Materials).

Discussion

The present study is the first to use EMA to examine predictors of affective states during the high-risk period following discharge from partial hospitalization. Studying this population at this specific juncture is important because residual symptoms are common at discharge and the transition to outpatient care is generally experienced as abrupt and anxiety-provoking for patients, putting them at risk for relapse (Horvitz-Lennon, Normand, Gaccione, & Frank, 2001; Larivière et al., 2010). A strength of this study is that we examined both concurrent and lagged relationships between variables of interest, given that concurrent analyses preclude any inference regarding the directions of effects.

Our study yielded several findings regarding the immediate experiences of individuals discharging from partial hospitalization that may inform treatment. We found that recent stressor severity was associated with lower PA and higher NA at the same time point and also prospectively predicted higher NA during the next 2–3 h period. These findings are in line with previous research demonstrating that stress is related to everyday affect (especially NA) in clinical samples (aan het Rot et al., 2012; Bylsma et al., 2011). In the context of discharge from a PHP, these findings also suggest that preventing, anticipating, and/or being able to cope with stressful events constitutes an important target for intervention.

Second, we also found that spending time with close relationships (i.e. friends, romantic partners, and relatives) was associated with improved affect at the same time point, and prospectively predicted higher PA during the next 2–3 h period. Conversely, NA prospectively predicted a lower likelihood of spending time with close relationships (similar to the findings of Brown et al., 2011). Regardless of the type of social contact, PA prospectively predicted spending time with more people (though the corresponding effect was small, as a 3-point increase in PA out of 7 would be needed to translate into spending time with one additional person). Together, these findings are in line with the limited body of previous research showing that positive social interactions are associated with improved affect in everyday life contexts (Pemberton & Fuller Tyszkiewicz, 2016). Thus, the quality (rather than quantity) of social interactions may be most likely

https://doi.org/10.1017/S0033291719004057 Published online by Cambridge University Press

Table 4. Types of stressors, relationships, and skills use reported by participants

Type	Within-person % of EMA surveys
Stressors	
Any	14
Interpersonal	8
Mental health	3
Daily living	2
Work-related	2
Other	2
Housing	1
Financial	1
Physical health	1
School-related	<1
Relationships	
Adult relative(s)	19
Romantic partner(s)	15
Friend(s)	14
Stranger(s)	8
Child relative(s)	7
Coworker(s)	6
Acquaintance(s)	5
Other(s)	4
Skills use	
Behavioral activation	27
Mindfulness	22
Interpersonal effectiveness	14
Cognitive restructuring	13
Emotion regulation	11
Distress tolerance	7

to immediately influence affective states, though all effects found were small.

Finally, we found that the recent use of one specific CBT skill (behavioral activation) and one specific DBT skill (interpersonal effectiveness) was concurrently associated with PA. In contrast, the recent use of distress tolerance was concurrently associated with NA. However, the use of these skills did not prospectively predict affective states over the next 2–3 h period. These concurrent associations can be explained in multiple ways. First, it is possible that practicing behavioral activation and interpersonal effectiveness is beneficial, but effects are not long-lasting enough to be captured 2–3 h later. The core principle underlying behavioral activation is the idea that engaging in potentially rewarding activities improves affect (Martell, Dimidjian, & Herman-Dunn, 2013). Interpersonal effectiveness skills may be especially useful given that interpersonal challenges were the most frequently endorsed type of stressor in this study. However, it is also possible that reporting high PA and low NA instead led participants to endorse having recently used these two skills, as the question about skills use followed affect items (e.g. when feeling good, participants may be more likely to *post-hoc* frame activities as behavioral activation, or interactions as interpersonal effectiveness). Similarly, individuals may be most likely to report using distress tolerance skills when they are in a bad mood (since distress tolerance is explicitly framed to address such situations).

The results of this study must be interpreted within the context of certain limitations. First, answers to EMA surveys are given via self-report and may therefore still be subject to biases (Shiffman et al., 2008). Furthermore, rates of survey completion were modest though comparable to previous reports in similar samples (e.g. Armey, Brick, Schatten, Nugent, & Miller, 2018). Second, the brief assessments used in this study could not capture important variables (e.g. the number of individuals a participant was with may not reflect how actively or skillfully they interacted, and may also have a nonlinear relationship with outcomes, a hypothesis not tested here). Third, though we took care to rule out the possibility that answering questions about skills use specifically would impart additional benefits, engaging in self-assessment more broadly may have still influenced affect. Fourth, this study used a very simple checklist to track therapeutic skills use, which would not be suitable for participants not previously exposed to this information as part of treatment and did not capture skillfulness (Kazantzis et al., 2017). Related, the very brief definitions of skills provided as reminders did not capture the nuances necessary to their proper application. For example, the definition of behavioral activation, 'I intentionally engaged in an activity (regardless of my initial level of motivation for this activity)', did not include all features of this skill (as described by Martell et al., 2013) and was specifically tailored to how behavioral activation is taught to individuals in an acute partial hospital setting who often do not derive immediate reinforcement from behavioral engagement. Fifth, additional studies using longer timeframes or multi-wave EMA designs are needed to determine whether findings generalize to time periods beyond the 2 weeks following discharge. Sixth, results from this study may not generalize to the experiences of participants discharging from other intensive treatment programs. Although our sample was transdiagnostic and high in severity and comorbidity (as is typical in PHPs), it was also limited in ethnoracial diversity and relatively high in education levels. Finally, we compensated participants in this study to minimize attrition and encourage consistent responding, which could have introduced a selection bias.

Despite these limitations, results from the present study provide a detailed examination of the daily experiences of individuals transitioning from partial hospitalization to outpatient care. Using EMA, we found that stressful events, social contact, and skills use were related to everyday affective states. Future work may expand on these findings to test other relationships (e.g. whether stress or social factors predict skills use) as well as indirect relationships. For example, social contact may be especially important for recovery after discharge insofar as it mitigates the experience of stress (Cohen & Wills, 1985). In keeping with growing interest in mobile health interventions (Myin-Germeys, Klippel, Steinhart, & Reininghaus, 2016; Schueller, Aguilera, & Mohr, 2017), our results can also provide preliminary information to design ecological momentary interventions for the post-acute period to enhance recovery during the transition from hospital-based to outpatient care.

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/S0033291719004057.

https://doi.org/10.1017/S0033291719004057 Published online by Cambridge University Press

Acknowledgements. We are very grateful to the staff and patients of the Behavioral Health Partial Hospital at McLean Hospital.

Financial support. We would like to thank McLean Hospital for the financial support provided for this project.

Conflict of interest. None.

Notes

1 A general overview of risk/protective factors for psychiatric relapse and rehospitalization is beyond the scope of this manuscript (but see Altman et al., 2006; Beshai, Dobson, Bockting, & Quigley, 2011; Moss et al., 2014 for reviews of these topics).

2 We chose this window of time based on consultation with focus groups of patients at the PHP who suggested that a shorter window would likely not be feasible and discourage participants from enrolling and/or staying in the study. Nonetheless, we encouraged participants to fill out surveys as soon as possible when they received each notification. In addition to the measures described here, participants also completed assessments of anxiety, sleep, as well as state self-efficacy and openness to experience. Because these measures were not part of our primary outcomes for this study, we do not report corresponding results here for brevity.

3 To investigate whether the quantity of social contact (i.e. number of people present) mattered above and beyond the presence vs. absence of others, we also ran these models substituting a binary variable (alone *v.* not alone). These models showed that not being alone was associated with lower levels of NA, but not PA. All other relationships remained similar.

References

aan het Rot, M., Hogenelst, K., & Schoevers, R. A. (2012). Mood disorders in everyday life: A systematic review of experience sampling and ecological momentary assessment studies. *Clinical Psychology Review*, *32*, 510–523.

Altman, S., Haeri, S., Cohen, L. J., Ten, A., Barron, E., Galynker, I. I., & Duhamel, K. N. (2006). Predictors of relapse in bipolar disorder: A review. *Journal of Psychiatric Practice*, *12*, 269–282.

Armey, M. F., Brick, L., Schatten, H. T., Nugent, N. R., & Miller, I. W. (2018). Ecologically assessed affect and suicidal ideation following psychiatric inpatient hospitalization. *General Hospital Psychiatry*. Advance Online Publication.

Asparouhov, T., Hamaker, E. L., & Muthén, B. (2018). Dynamic structural equation models. *Structural Equation Modeling: A Multidisciplinary Journal*, *25*, 359–388.

Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). *Cognitive therapy of depression*. New York: Guilford Press.

Beshai, S., Dobson, K. S., Bockting, C. L. H., & Quigley, L. (2011). Relapse and recurrence prevention in depression: Current research and future prospects. *Clinical Psychology Review*, *31*, 1349–1360.

Bickel, R. (2007). *Multilevel analysis for applied research: It's just regression!* New York: Guilford Press.

Björgvinsson, T., Kertz, S. J., Bigda-Peyton, J. S., Rosmarin, D. H., Aderka, I. M., & Neuhaus, E. C. (2014). Effectiveness of cognitive behavior therapy for severe mood disorders in an acute psychiatric naturalistic setting: A benchmarking study. *Cognitive Behaviour Therapy*, *43*, 209–220.

Boyer, C. A., McAlpine, D. D., Pottick, K. J., & Olfson, M. (2000). Identifying risk factors and key strategies in linkage to outpatient psychiatric care. *American Journal of Psychiatry*, *157*, 1592–1598.

Brown, L. H., Strauman, T., Barrantes-Vidal, N., Silvia, P. J., & Kwapil, T. R. (2011). An experience-sampling study of depressive symptoms and their social context. *The Journal of Nervous and Mental Disease*, *199*, 403–409.

Bylsma, L. M., & Rottenberg, J. (2011). Uncovering the dynamics of emotion regulation and dysfunction in daily life with ecological momentary assessment. In I. Nyklicek, A. Vingerhoets & M. Zeelenberg (Eds.), *Emotion regulation and well-being* (pp. 225–244). New York: Springer.

Bylsma, L. M., Taylor-Clift, A., & Rottenberg, J. (2011). Emotional reactivity to daily events in major and minor depression. *Journal of Abnormal Psychology*, *120*, 155–167.

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, *98*, 310–357.

Conklin, L. R., & Strunk, D. R. (2015). A session-to-session examination of homework engagement in cognitive therapy for depression: Do patients experience immediate benefits? *Behaviour Research and Therapy*, *72*, 56–62.

Ebner-Priemer, U. W., & Trull, T. J. (2009). Ecological momentary assessment of mood disorders and mood dysregulation. *Psychological Assessment*, *21*, 463–475.

Finan, P. H., Zautra, A. J., & Wershba, R. (2011). The dynamics of emotion in adaptation to stress. In R. Contrada & A. Baum (Eds.), *The handbook of stress science: Biology, psychology, and health* (pp. 209–220). New York: Springer.

Forgeard, M., Beard, C., Kirakosian, N., & Björgvinsson, T. (2018). Research in partial hospital settings. In R. T. Codd (Ed.), *Practice-Based research: A guide for clinicians* (pp. 212–239). New York: Routledge.

Fuller-Tyszkiewicz, M., Karvounis, T., Pemberton, R., Hartley-Clark, L., & Richardson, B. (2017). Determinants of depressive mood states in everyday life: An experience sampling study. *Motivation and Emotion*, *41*, 510–521.

Geldhof, G. J., Preacher, K. J., & Zyphur, M. J. (2014). Reliability estimation in a multilevel confirmatory factor analysis framework. *Psychological Methods*, *19*, 72–91.

Grimm, K. J., Ram, N., & Estabrook, R. (2017). *Growth modeling: Structural equation and multilevel modeling approaches*. New York: Guilford.

Hoet, A. C., Burgin, C. J., Eddington, K. M., & Silvia, P. J. (2018). Reports of therapy skill use and their efficacy in daily life in the short-term treatment of depression. *Cognitive Therapy and Research*, *2*, 184–192.

Horvitz-Lennon, M., Normand, S.-L. T., Gaccione, P., & Frank, R. G. (2001). Partial versus full hospitalization for adults in psychiatric distress: A systematic review of the published literature (1957–1997). *American Journal of Psychiatry*, *158*, 676–685.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*, 1–55.

Johnson, L., Lundström, O., Åberg-Wistedt, A., & Mathé, A. (2003). Social support in bipolar disorder. *Bipolar Disorders*, *5*, 129–137.

Kallert, T. W., Priebe, S., McCabe, R., Kiejna, A., Rymaszewska, J., Nawka, P., … Schützwohl, M. (2007). Are day hospitals effective for acutely ill psychiatric patients? A European multicenter randomized controlled trial. *The Journal of Clinical Psychiatry*, *68*, 278–287.

Kazantzis, N., Brownfield, N. R., Mosely, L., Usatoff, A. S., & Flighty, A. J. (2017). Homework in cognitive behavioral therapy: A systematic review of adherence assessment in anxiety and depression (2011–2016). *Psychiatric Clinics of North America*, *40*, 625–639.

Kazantzis, N., Deane, F. P., & Ronan, K. R. (2004). Assessing compliance with homework assignments: Review and recommendations for clinical practice. *Journal of Clinical Psychology*, *60*, 627–641.

Kazantzis, N., Whittington, C., & Dattilio, F. (2010). Meta-analysis of homework effects in cognitive and behavioral therapy: A replication and extension. *Clinical Psychology: Science and Practice*, *17*, 144–156.

Kessler, R. C., Kendler, K. S., Heath, A., Neale, M. C., & Eaves, L. J. (1992). Social support, depressed mood, and adjustment to stress: A genetic epidemiologic investigation. *Journal of Personality and Social Psychology*, *62*, 257–272.

Kline, R. B. (2005). *Principles and practice of structural equation modeling*. New York: Guilford.

Kroenke, K., & Spitzer, R. L. (2002). The PHQ-9: A new depression diagnostic and severity measure. *Psychiatric Annals*, *32*, 509–515.

Larivière, N., Desrosiers, J., Tousignant, M., & Boyer, R. (2010). Who benefits the most from psychiatric day hospitals? A comparison of three clinical groups. *Journal of Psychiatric Practice*, *16*, 93–102.

Lethbridge, R., & Allen, N. B. (2008). Mood induced cognitive and emotional reactivity, life stress, and the prediction of depressive relapse. *Behaviour Research and Therapy*, *10*, 1142–1150.

Linehan, M. (1993). *Cognitive-behavioral treatment of borderline personality disorder*. New York: Guilford Press.

Marshall, M., Crowther, R., Sledge, W. H., Rathbone, J., & Soares-Weiser, K. (2011). Day hospital versus admission for acute psychiatric disorders. *The Cochrane Database of Systematic Reviews*.

https://doi.org/10.1017/S0033291719004057 Published online by Cambridge University Press

Martell, C. R., Dimidjian, S., & Herman-Dunn, R. (2013). *Behavioral activation for depression: A clinician's guide*. New York: Guilford Press.

Moss, J., Li, A., Tobin, J., Weinstein, I. S., Harimoto, T., & Lanctôt, K. L. (2014). Predictors of readmission to a psychiatry inpatient unit. *Comprehensive Psychiatry*, *55*, 426–430.

Mroczek, D. K., & Almeida, D. M. (2004). The effect of daily stress, personality, and age on daily negative affect. *Journal of Personality*, *72*, 355–378.

Muthén, L. K., & Muthén, B. O. (2017). *Mplus user's guide* (8th ed.). Los Angeles: Muthén & Muthén.

Myin-Germeys, I., Klippel, A., Steinhart, H., & Reininghaus, U. (2016). Ecological momentary interventions in psychiatry. *Current Opinion in Psychiatry*, *29*, 258–263.

Nezlek, J. B. (2007). A multilevel framework for understanding relationships among traits, states, situations and behaviours. *European Journal of Personality*, *21*, 789–810.

Nezlek, J. B., & Gable, S. L. (2001). Depression as a moderator of relationships between positive daily events and day-to-day psychological adjustment. *Personality and Social Psychology Bulletin*, *27*, 1692–1704.

Paykel, E. S. (1994). Life events, social support and depression. *Acta Psychiatrica Scandinavica*, *89*, 50–58.

Peeters, F., Berkhof, J., Rottenberg, J., & Nicolson, N. A. (2010). Ambulatory emotional reactivity to negative daily life events predicts remission from major depressive disorder. *Behaviour Research and Therapy*, *48*, 754–760.

Pemberton, R., & Fuller Tyszkiewicz, M. D. (2016). Factors contributing to depressive mood states in everyday life: A systematic review. *Journal of Affective Disorders*, *200*, 103–110.

Schueller, S. M., Aguilera, A., & Mohr, D. C. (2017). Ecological momentary interventions for depression and anxiety. *Depression and Anxiety*, *34*, 540–545.

Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janavs, J., Weiller, E., … Dunbar, G. C. (1998). The Mini-International Neuropsychiatric Interview (MINI): The development and validation of a structured diagnostic interview for DSM-IV and ICD-10. *Journal of Clinical Psychiatry*, *59*, 22–33.

Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological momentary assessment. *Annual Review of Clinical Psychology*, *4*, 1–32.

Snippe, E., Simons, C. J., Hartmann, J. A., Menne-Lothmann, C., Kramer, I., Booij, S. H., … Wichers, M. (2016). Change in daily life behaviors and depression: Within-person and between-person associations. *Health Psychology* , *35*, 433–441.

Steffen, S., Kösters, M., Becker, T., & Puschner, B. (2009). Discharge planning in mental health care: A systematic review of the recent literature. *Acta Psychiatrica Scandinavica*, *120*, 1–9.

Suls, J., Green, P., & Hillis, S. (1998). Emotional reactivity to everyday problems, affective inertia, and neuroticism. *Personality and Social Psychology Bulletin*, *24*, 127–136.

van der Stouwe, E. C., Groenewold, N. A., Bos, E. H., de Jonge, P., Wichers, M., & Booij, S. H. (2019). How to assess negative affective reactivity to daily life stress in depressed and nondepressed individuals? *Psychiatry Research*, *279*, 259–266.

Vigod, S. N., Kurdyak, P. A., Dennis, C.-L., Leszcz, T., Taylor, V. H., Blumberger, D. M., & Seitz, D. P. (2013). Transitional interventions to reduce early psychiatric readmissions in adults: Systematic review. *The British Journal of Psychiatry*, *202*, 187–194.

Vranceanu, A.-M., Gallo, L. C., & Bogart, L. M. (2009). Depressive symptoms and momentary affect: The role of social interaction variables. *Depression and Anxiety*, *26*, 464–470.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*, 1063–1070.

Wichers, M., Myin-Germeys, I., Jacobs, N., Peeters, F., Kenis, G., Derom, C., … Os, J. V. (2007). Genetic risk of depression and stress-induced negative affect in daily life. *The British Journal of Psychiatry*, *191*, 218–223.

Zautra, A. J., Reich, J. W., Davis, M. C., Potter, P. T., & Nicolson, N. A. (2000). The role of stressful events in the relationship between positive and negative affects: Evidence from field and experimental studies. *Journal of Personality*, *68*, 927–951.

https://doi.org/10.1017/S0033291719004057 Published online by Cambridge University Press