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Turning the UPPS down: Urgency predicts treatment outcome in a partial hospitalization program

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ABSTRACT

Background: Impulsivity in response to negative mood (negative urgency) and positive mood (positive urgency) is common in psychiatric disorders. The aims of this study were to test if urgency predicts treatment response during partial hospitalization in a transdiagnostic sample, and if urgency is malleable over the course of brief treatment.

Method: Participants ($N = 348$, 55% female, M age $= 32.9$) were patients presenting to a CBT-based partial hospitalization program. Urgency and a range of symptoms were assessed with self-report measures during treatment.

Results: Higher negative urgency scores predicted worse outcome for depression and anxiety symptoms. Negative urgency ($p < .001$, Cohen's $d_z = 0.61$) and positive urgency ($p < .001$, Cohen's $d_z = 0.39$) significantly decreased during treatment.

Discussion: Findings suggest that participants report decreases in urgency during brief partial hospitalization treatment. Higher negative urgency predicted poorer treatment response for symptoms of depression and anxiety, demonstrating the need for novel treatments for urgency.

1. Introduction

Impulsivity has been widely studied as a correlate, symptom, and predictor of phenotypically diverse psychiatric disorders. Impulsivity is multifaceted [1,2], and recent research has increasingly focused on specific links between emotion-related aspects of impulsivity and psychopathology. The UPPS model with dimensions of Urgency (mood-based impulsive action), (Lack of) Perseverance, (Lack of) Premeditation, and Sensation Seeking, provides one common framework for describing traits that relate to impulsive behavior [2]. Within the UPPS model, urgency is defined as rash action occurring in the context of either negative emotion (negative urgency) or positive emotion (positive urgency [3]). Both negative and positive urgency involve impulsive action specifically in response to emotion, and evidence suggests that these two dimensions of urgency are strongly correlated [4].

Dimensions of the UPPS model are typically assessed using the UPPS-P self-report measure [5], which includes two specific subscales assessing negative and positive urgency. Studies using these scales provide remarkably consistent evidence that urgency is correlated with psychopathology. As compared to other dimensions of impulsivity assessed via the UPPS, a recent meta-analysis reported that urgency (particularly negative urgency) showed the strongest correlations with a range of psychiatric symptoms including depression, substance use, anxiety, self-harm/suicidality, and disordered eating [6]. Other studies have documented an even broader profile of symptoms and outcomes that correlate with urgency, including obsessional symptoms of OCD [7,8], symptoms of Generalized Anxiety Disorder [9], aggression [6,10], and suicide attempts [11]. Case-control studies also reveal elevations in urgency in a diverse range of diagnostic groups, including individuals diagnosed with bipolar I disorder [12], eating disorders [13], major depressive disorder [14], and schizophrenia [15]. Finally, urgency prospectively predicts a range of symptoms and risky behaviors, such as depression, self-injury, and substance use outcomes [16–20]. Together, these findings support the premise that tendencies to react impulsively to emotion states are transdiagnostic [21].

Despite these consistent findings, there is surprisingly little known about whether urgency influences treatment outcomes. Given the range of symptoms and harmful outcomes associated with urgency, one might predict that people who struggle with impulsive reactions to emotions may also experience less benefit from standard treatments. Evidence from studies of two specific populations supports this hypothesis. In one study of patients with binge eating disorder, higher levels of Negative Urgency at the beginning of treatment was associated with worse clinical outcomes and a slower response to treatment over the course of acceptance-based group psychotherapy [22]. Somewhat more is known about how urgency affects the course of treatment for substance use disorders: a small meta-analysis of four studies found

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that among individuals receiving psychotherapy for substance use disorders, higher levels of Negative Urgency were associated with worse treatment outcomes [23]. Outside of substance use and binge eating disorder, no studies have evaluated how urgency relates to treatment outcomes for psychiatric disorders more broadly. This includes a lack of data on how urgency might affect treatment outcomes for some of the symptoms and disorders most commonly linked to this form of impulsivity, including depression, anxiety symptoms, and self-injury.

Separately, researchers have only recently begun to assess whether urgency can be modulated with treatment. Existing treatments such as Dialectical Behavior Therapy include strategies to manage impulsive reactions to emotion (e.g., distress tolerance skills [24], and cognitive-behavioral treatments such as the Unified Protocol encourage patients to identify and modify emotion-driven behaviors [25]. Yet, very little is known about how these treatments influence urgency itself. Limited evidence suggests that urgency may be malleable over short periods of time. In one study of individuals enrolled in a residential substance use disorder treatment program, negative urgency scores significantly declined within four weeks of treatment, although positive urgency showed no significant change [26]. Similarly, Hershberger and colleagues' meta-analysis of urgency and substance use psychotherapies found that negative urgency showed a small but significant decrease from pre- to post-treatment, with no significant change in positive urgency [23]. Outside of substance use disorder treatment, one study conducted in a non-clinical sample suggests that urgency is malleable via experimental intervention; in this study, undergraduate students receiving a single-session emotion regulation intervention reported significant decreases in both negative and positive urgency over one week [27]. Overall, these findings show that it is plausible to predict that urgency can be reduced over a relatively short period of time. Similar to findings on how urgency influences treatment, however, there is a lack of knowledge on how urgency responds to treatment in clinical samples outside of substance use disorders.

1.1. Aims and hypotheses

The primary aims of this study were to test if negative and positive urgency predict response to treatment, and if participants would report changes in urgency over the course of brief intensive naturalistic psychiatric treatment. We tested these aims in a transdiagnostic sample of adults with psychiatric disorders attending a partial hospitalization program (PHP). A PHP is the ideal environment to test hypotheses about treatment-related changes in urgency, given that: 1) patients present with a wide variety of symptoms and emotional disorders linked to urgency, and 2) despite the transdiagnostic nature of the patient population, the treatment is of a similar type and duration across patients.

We therefore tested three hypotheses regarding urgency and psychiatric hospital treatment. First, we expected that higher baseline levels of negative urgency and positive urgency would predict worse treatment response, as defined by higher post-treatment scores on four symptom measures that have been previously linked to urgency: depression, anxiety, self-harm, and substance use. Second, we hypothesized that negative urgency scores would significantly decrease from pre- to post-treatment, based on previous studies documenting significant change in urgency during treatment. Third, we hypothesized that positive urgency would decrease, based on some prior research supporting the premise that positive urgency is malleable [27], and on other evidence showing that negative and positive urgency are highly correlated and may be part of the same overarching construct [4,28]. Thus, we hypothesized that positive urgency would be expected to decrease if negative urgency did so as well.

2. Methods

Participants ($N = 348$) were patients (≥18 years) recruited from a PHP in the Northeastern United States. Individuals presenting for treatment at this PHP include a mix of those referred directly from inpatient settings for further stabilization and individuals referred from the community who require a higher level of care. The average length of stay in the PHP is designed to be seven to ten business days, with an average length of stay of 8.2 ($SD = 3.2$) business days; in the present sample, individuals' average total, cumulative length of stay (time including weekends) was 12.09 days ($SD = 3.65$) days. Patients admitted to the PHP present with mood disorders, personality disorders, psychotic disorders, and anxiety disorders, all requiring partial level of care. In the present study, participants averaged 32.88 years old ($SD = 13.97$, range: 18–70) and were 55.2% female (see Table 1).

Treatment in the PHP is based on Cognitive-Behavioral principles. Individuals attend up to five psychotherapy groups per day that teach CBT and DBT-based skills, including self-monitoring, cognitive restructuring, behavioral activation, effective communication strategies, distress tolerance, mindfulness, and emotion regulation. Patients also receive individual therapy sessions three times per week, regular case management meetings throughout the week, and medication management from a program psychiatrist.

All patients at the PHP complete clinical self-report measures at admission, discharge, and at multiple interim points as part of routine outcome monitoring. Participants enrolled in the present study provided written informed consent to have their clinical data used for research,

Table 1
Demographic and clinical characteristics of sample.

Demographic and clinical characteristics	*n*	(%)[1]
Female	192	(55.2%)
Male	156	(44.8%)
Age (M, *SD*)	32.9	(13.97)
Race and ethnicity		
American Indian or Alaskan Native	1	(0.3%)
Asian	13	(3.7%)
African American or Black	5	(1.4)
White	299	(85.9%)
Other	1	(0.3%)
More than one race	22	(6.3%)
Ethnicity		
Not Hispanic or Latino/a	338	(97.1%)
Hispanic or Latino/a	10	(2.9%)
Marital status		
Never married	226	(64.9%)
Married	75	(21.6%)
Living with partner	14	(4.0)
Divorced/separated	30	(8.6)
Widowed	3	(0.9%)
Highest level of education		
<High School/GED	3	(0.9%)
High School/GED	18	(5.2%)
Some college/associates/trade school	137	(39.5%)
4-year college graduate	98	(28.2%)
Post-college education	91	(26.2%)
Hospitalized in inpatient psychiatric program last 6 mos.		
Yes	163	(47.1%)
No	183	(52.9%)
MINI diagnoses	*n*	(%)[2]
Major depressive episode-current	174	(50%)
Major depressive episode-lifetime	276	(79.3%)
Manic episode-current	2	(0.6%)
Manic episode-lifetime	65	(18.7%)
Generalized anxiety disorder (current)	116	(33.3%)
Psychotic disorder (current)	16	(4.6%)
Social anxiety disorder (current)	97	(27.9%)
Obsessive-compulsive disorder (current)	39	(11.2%)
Posttraumatic stress disorder (current)	42	(12.1%)
Panic disorder (current)	59	(17.0%)
Body dysmorphic disorder (current)	19	(5.5%)
Alcohol abuse (past year)	21	(6.0)
Alcohol dependence (past year)	45	(12.9)
Missing[3]	47	(13.5%)

[1] Percentage of valid data not including missing cases.
[2] Due to comorbidity, percentages sum to >100.
[3] Missing all MINI data because interview not conducted with this participant.

and all measures, procedures, and methods were approved by a human subjects review committee. Measures were administered via computer, using the Research Electronic Data Capture (REDCap) program [29]. For the analyses reported here, we included only those participants who had not previously attended this PHP and who provided self-report data on their date of discharge from the program (as some patients dropped out prematurely due to a variety of reasons including clinical acuity and hospitalization, or attrition). Of 607 potential participants who attended the partial hospital during the study recruitment period (March–December 2015), 427 individuals attending this PHP for the first time consented to participation. The final sample included 348 participants who completed the UPPS and symptom measures on their day of discharge. Participants who dropped out prior to discharge did not differ from those included in the analyses below on any UPPS scales ($ps > 0.32$), with the exception of higher scores on the Lack of Perseverance scale in the dropout group, $t(402) = 2.52$, $p = .04$. Participants who dropped out prior to discharge also reported higher scores on the self-harm scale of the BASIS-24, $t(413) = 2.12$, $p = .04$, but did not differ on any other symptom measures ($ps >. 36$).

2.1. Measures

2.1.1. UPPS-P impulsivity scale-short version

The UPPS-P short version [5,30] is a self-report measure of traits related to impulsivity, each rated on a one ("Agree Strongly") to four ("Disagree Strongly") scale: Negative Urgency, Positive Urgency, lack of Perseverance (difficulties with sustaining engagement in activities or tasks); lack of Premeditation (acting without plan or forethought); and Sensation Seeking (willingness to take risks for novel or stimulating pursuits). In this study, we used a previously validated, abbreviated version of the UPPS-P that included four items from each of these subscales [30]. Scoring of each UPPS-P subscale was coded so that higher scores indicate higher levels of impulsivity and subscale scores were averaged.

The UPPS-P was administered on the second day of the program and at discharge, as well as on an every-other-day basis during the duration of each participants' stay in the PHP. For all interim assessments of the UPPS-P, the instructions were appended to read "…thinking about the PAST 24 HOURS." Instructions were not appended for the baseline or discharge assessments. We included the Negative Urgency and Positive Urgency scales as our primary measures of emotion-driven impulsivity. The shortened Negative Urgency scale showed acceptable reliability at baseline ($\alpha = 0.73$) and good reliability at discharge ($\alpha = 0.85$), while the Positive Urgency scale showed good reliability at both baseline ($\alpha = 0.85$) and discharge ($\alpha = 0.88$). The interim measures of urgency with modified 24-h instructions also showed good reliability, ranging from $\alpha = 0.80$ to 0.87 for Negative Urgency and $\alpha = 0.82$ to 0.89 for Positive Urgency. Other subscales of the UPPS-P showed variable reliability: Lack of Perseverance $\alpha = 0.69$ at baseline and discharge; Lack of Premeditation $\alpha = 0.80$ at baseline and 0.85 at discharge; Sensation Seeking $\alpha = 0.67$ at baseline and 0.78 at discharge.

2.1.2. Behavior and symptom identification scale-revised (BASIS-24)

The BASIS-24 [31] is a brief measure of symptom frequency and symptom impact on functioning over the previous week. It encompasses six subscales: Depression/Functioning (six items), Interpersonal Relationships (five items), Psychosis (four items), Substance Abuse (four items, assessing urges to use substances and problems related to use); Self-Harm (two items; assessing suicidal and self-harm ideation); and Emotional Lability (four items). Previous studies have validated both the reliability and validity of BASIS-24 subscales [31,32]. For the present study, we used the BASIS-24 subscales of Substance Abuse and Self-Harm indicators of treatment outcome, based on previous research showing strong links between urgency and substance use and self-harm/suicidality. Reliability for the BASIS subscales were acceptable or better (Self-harm subscale: $\alpha = 0.81$ at baseline and 0.78 at discharge; Substance Abuse subscale: $\alpha = 0.78$ at baseline), with the exception of the Substance Abuse scale at discharge ($\alpha = 0.69$).

2.1.3. Center for epidemiologic studies depression scale (CES-D-10)

The CES-D-10 [33] is a ten-item self-report measure of depression symptoms. Items on this scale are rated from zero ("Rarely or none of the time (less than 1 day")) to 3 ("most or all of the time (5 to 7 days))." In the present study, the CES-D-10 was used as the primary treatment outcome indicator for depression symptoms. Reliability in the present study was good for both baseline ($\alpha = 0.85$) and discharge ($\alpha = 0.87$) assessments.

2.1.4. Generalized anxiety disorder 7-item scale (GAD-7)

The GAD-7 [34] includes seven items rated on a four-point scale, assessing anxiety-related symptoms. It was developed as a screening measure for Generalized Anxiety Disorder Symptoms but has been validated as a global measure of anxiety symptom severity [35]. The GAD-7 was used as the primary treatment outcome indicator for anxiety-related symptoms. Reliability in the present study was good for both baseline ($\alpha = 0.87$) and discharge ($\alpha = 0.89$) assessments.

2.1.5. MINI international neuropsychiatric interview

The MINI [36] is a structured diagnostic interview used to assess DSM-IV Axis I disorders. Previous studies have demonstrated the validity and inter-rater reliability of MINI diagnoses [36]. MINI interviews were administered by clinical psychology doctoral student interns and practicum students who completed extensive training prior to administering interviews; all interviewers were trained by post-doctoral level partial program staff who also provided regular supervision. Diagnoses obtained from the MINI were used in the present study to characterize the sample.

2.2. Analysis plan

All analyses were conducted with SPSS Version 24.0 [37], except for Growth Modeling analyses, which were conducted in MPlus 8 [39]. Hypotheses about urgency and treatment outcome were tested using hierarchical linear regression analyses. The hypothesis about treatment-related change in Negative Urgency and Positive Urgency was tested using repeated measures ANOVA, controlling for demographic and symptom covariates. Change in other primary study variables of interest were tested via dependent t-tests, with Cohen's d_z calculated as a measure of within-subjects effect size (eq. 7 in [40]). We also used Growth Modeling to further probe the nature of changes which allowed for the inclusion of all participants (including those with missing daily data). We did not generate a priori hypotheses regarding other dimensions of impulsivity also captured by the UPPS-P measure (Lack of Perseverance, Lack of Planning, and Sensation Seeking); however, we include these measures below in analyses of treatment-related change solely for comparison to the urgency variables. Pearson correlations are also presented to show zero-order correlations between all variables at the beginning of treatment. For all analyses, "baseline" refers to the first time a measure was assessed (Day 2 of treatment for the UPPS-P scale and the MINI; Day 1 of treatment for all other variables). "Post-treatment" refers to measures collected on the day of discharge from the PHP.

3. Results

Table 1 shows demographic and diagnostic characteristics of the sample. Of participants with available diagnostic data on the MINI ($n = 301$), all (100%) met criteria for at least one diagnosis. Participants who did not have MINI data available ($n = 47$) were missing data for a variety of reasons, such as: short duration of stay in the program and not enough time to conduct interview; treatment team request to not administer the MINI; or scheduling difficulties.

Prior to hypothesis testing, we tested for potential confounds by examining relationships between baseline Negative and Positive Urgency and demographic variables. At baseline, men reported higher Positive Urgency scores than women, $t(342) = -3.45$, $p = .001$, Cohen's $d_z = 0.19$; there was no evidence of significant sex differences in Negative Urgency; $t(343) = 1.25$, $p = .21$. Sex was included as a covariate in each of the regression models and ANOVAs described below. Urgency was unrelated to age (Negative Urgency: $r(344) = -0.03$, $p = .53$; Positive Urgency: $r(343) = -0.09$, $p = .11$) and race (Negative Urgency; $\chi^2(60) = 48.07$, $p = .87$; Positive Urgency: $\chi^2(60) = 54.30$, $p = .68$). Table 2 displays zero-order correlations between baseline urgency scores and clinical variables. Consistent with previous cross-sectional findings, Negative Urgency was correlated with a range of externalizing and internalizing symptoms. Positive Urgency was correlated with the BASIS-24 substance abuse scale, but was not significantly correlated with other baseline symptoms.

3.1. Hypothesis 1: Baseline urgency predicts treatment outcome

Four parallel linear regression models were used to test the hypothesis that baseline negative and positive urgency scores would predict higher symptom levels (i.e., worse outcome) at discharge. The dependent variable for each model was symptom level at discharge (CES-D-10, GAD-7, BASIS-24 Self-Harm, or BASIS-24 Substance Use). Step 1 of each model included sex and baseline symptoms of the dependent variable, followed by baseline Negative Urgency in Step 2, and baseline Positive Urgency in step 3. Regardless of the dependent variable in question, each of the analyses also included baseline depression (CES-D-10) and anxiety symptoms (GAD-7) in Step 1 to control for the presence of these symptoms. Given the sizeable correlation between the urgency scales, scores for these measures were centered prior to these analyses to reduce the effects of multicollinearity.

Results of these regression model for depression outcomes (overall variance explained: adjusted $R^2 = 0.42$; $F(5, 327) = 48.07$, $p < .001$) showed that higher Negative Urgency scores at baseline predicted higher levels of depression on the CES-D-10 at discharge; $\beta = 0.11$, $p = .03$; R^2 change $= 0.01$, $p = .01$. Results were parallel for the model predicting GAD-7 anxiety outcomes (overall variance explained: adjusted $R^2 = 0.41$; $F(5, 330) = 47.10$, $p < .001$), with higher Negative Urgency scores at baseline predicting higher levels of anxiety at discharge, $\beta = 0.14$, $p < .01$; R^2 change $= 0.02$, $p < .01$. Positive Urgency was not a significant predictor of depression ($\beta = 0.00$, $p = .89$) nor of anxiety symptoms ($\beta = 0.00$, $p = .98$). In contrast to hypotheses, neither urgency scale was a significant predictor of self-harm ideation (Negative Urgency: R^2 change $= 0.005$, $F\Delta\ (1320) = 2.24$, $p = .14$; Positive Urgency: $R^2\ \Delta = 0.00$, $F\Delta\ (1, 319) = 0.09$, $p = .77$) or substance abuse (Negative Urgency: $R^2\ \Delta = 0.004$, $F\Delta\ (1, 323) = 2.42$, $p = .12$, Positive Urgency: $R^2\ \Delta = 0.002$, $F\Delta\ (1, 322) = 1.51$, $p = .22$).

Table 2
Correlations between variables at baseline.

Scale	1	2	3	4	5	6
1. Negative urgency	–					
2. Positive urgency	0.50***	–				
3. CES-D	0.25***	0.04	–			
4. GAD-7	0.26***	0.09	0.67***	–		
5. BASIS self-harm scale	0.21***	0.06	0.38***	0.27***	–	
6. BASIS substance abuse scale	0.22***	0.25***	0.03	0.11*	0.01	–

CES-D = Center for Epidemiologic Studies-Depression Scale - 10 Item Version; GAD-7 = Generalized Anxiety Disorder Scale 7-item scale.
*$p < .05$.
**$p < .01$.
***$p < .001$.

3.2. Hypothesis 2: Urgency decreases during treatment

Table 3 shows dependent *t*-tests for change in all main study variables over the course of treatment. As predicted, patients reported a significant decrease in both Negative and Positive Urgency over the course of treatment. These decreases corresponded to a medium decline for Negative Urgency and a small to medium decline in Positive Urgency [41]; the Lack of Premeditation and Sensation Seeking scales each showed small but significant declines, while the Lack of Perseverance subscale did not significantly change. Repeated-measures ANOVA was used to separately test change in Negative Urgency (from baseline to discharge) and change in Positive Urgency. In both of these analyses, all variables tested in the preceding section were entered, including: sex, depression symptoms (CES-D-10), anxiety symptoms (GAD-7), and the self-harm and substance use scales from the BASIS-24 (all covariates assessed at baseline). Results of both analyses revealed significant decreases in Negative Urgency, $F(1, 320) = 13.01$, $p < .001$, partial $\eta^2 = 0.039$, and in Positive Urgency, $F(1, 321) = 8.11$, $p = .005$, partial $\eta^2 = 0.025$.

Linear Growth Modeling was conducted to characterize change in Positive and Negative Urgency in this sample (Fig. 1) using maximum likelihood estimation; 19% of datapoints were missing in total (1%, 2.5%, 9%, 28%, and 59% of datapoints were missing at each successive timepoint). These analyses corresponded to measurement of the Urgency scales on the second day of treatment ("baseline"), as well as interim treatment days 4, 6, 8, and 10. Given that some participants discharged prior to the final interim timepoint and some discharged after this point, these analyses differ from the baseline-to-discharge *t*-tests and repeated measures ANOVA in that that not all discharge timepoints are represented in the analysis. Thus, the analyses above represent change in Urgency from beginning to end of treatment, while the Linear Growth Models show change across the interim treatment points. For the Linear Growth Model analyses, we compared a no-growth model (NGM) and a linear growth model (LGM) for both Positive and Negative Urgency. Examination of relative AIC/BIC values, as well as chi-square difference tests, however indicated that the linear growth models provided a better fit for the data for both Positive (*NGM*: AIC = 1939, BIC = 1944, $\chi^2(13) = 48.6$, RMSEA = 0.09 [0.06, 0.12], SRMR = 0.07, CFI = 0.97; *LGM*: AIC = 1921, BIC = 1928, $\chi^2(10) = 24.89$, RMSEA = 0.07 [0.03, 0.10], SRMR = 0.02, CFI = 0.99; *NGM/LGM*: $\Delta\chi^2(3) = 23.71$, $p < .001$) and Negative (*NGM*: AIC = 2467, BIC = 2472, $\chi^2(13) = 121.49$, RMSEA = 0.16 [0.13, 0.18], SRMR = 0.19, CFI = 0.86; *LGM*: AIC = 2376, BIC = 2383, $\chi^2(10) = 24.14$, RMSEA = 0.06 [0.03, 0.10], SRMR = 0.08, CFI = 0.98; *NGM/LGM*: $\Delta\chi^2(3) = 97.35$, $p < .001$) Urgency. We therefore retained the linear growth models for further examination.

Regarding Negative Urgency, the means for both the intercept ($\beta = 4.47$, $p < .001$) and the slope ($\beta = -1.05$, $p \leq 0.001$) were significant. In other words, participants' level of Negative Urgency differed significantly from zero at baseline, and decreased significantly during treatment. The intercept and the slope were not significantly correlated ($p > .05$). Similarly, for Positive Urgency, the means for both the intercept ($\beta = 3.06$, $p < .001$) and the slope ($\beta = -0.61$, $p = .004$) were significant. The intercept and the slope were not significantly correlated ($p > .05$). Fig. 1 shows the trajectory of change for both Negative and Positive Urgency.

3.3. Exploratory analyses: Change in urgency with change in symptoms

Post-hoc analyses were conducted to evaluate whether the observed changes in urgency correlated with changes in symptoms over the course of treatment. As Table 3 shows, participants reported significant decreases in each symptom assessed. Change scores for negative and positive urgency, depression symptoms (CES-D), anxiety symptoms (GAD-7), substance use, and self-harm (both from the BASIS) were calculated by subtracting baseline scores on these measures from discharge scores. Prior to conducting these analyses, a *t*-test with sex as

Table 3
Baseline to discharge change in measures with dependent t-tests, effect size estimates, and sample size.

Scale	Baseline mean (SD)	Discharge mean (SD)	t-test (*p*-value)	Cohen's d_z	Sample size (t-test)
Negative urgency	2.70 (0.71)	2.29 (0.79)	11.27***	0.61	342
Positive urgency	1.99 (0.76)	1.78 (0.74)	7.23***	0.39	341
(Lack of) perseverance	1.92 (0.55)	1.88 (0.52)	1.46	0.08	344
(Lack of) premeditation	1.91 (0.61)	1.77 (0.59)	5.03***	0.27	342
Sensation seeking	2.39 (0.73)	2.32 (0.81)	2.66**	0.14	338
CES-D-10	16.75 (6.46)	12.12 (6.09)	14.62***	0.80	337
GAD-7	11.44 (5.31)	7.82 (4.86)	14.57***	0.79	340
BASIS self-harm scale	0.66 (0.85)	0.37 (0.62)	7.53***	0.41	341
BASIS substance abuse scale	0.54 (0.74)	0.42 (0.63)	3.66***	0.20	342

CES-D = Center for Epidemiologic Studies-Depression Scale - 10 Item Version; GAD-7 = Generalized Anxiety Disorder Scale 7-item scale.
** $p < .01$.
*** $p < .001$.

the independent variable revealed that women showed greater change in depression than did men; $t(322) = 2.36$, $p = .02$, and that men reported significantly greater decreases in positive urgency than did women, $t(325) = 1.98$, $p = .05$.

Across all participants, change in negative urgency was weakly but significantly correlated with changes in depression ($r = 0.20$, $p < .001$), anxiety ($r = 0.12$, $p = .03$), and substance abuse ($r = 0.15$, $p < .01$), but not self-harm ($r = 0.09$, $p = .10$). Change in positive urgency was significantly correlated with change in substance abuse ($r = 0.18$, $p < .01$) and self-harm ($r = 0.12$, $p = .04$), but not depression or anxiety ($ps > 0.13$). When correlations between change scores were assessed separately by sex, no significant correlations between change in negative urgency and change in any symptoms were observed in women ($ps > 0.11$). However, men showed significant correlations between change in negative urgency and change in depression ($r = 0.34$, $p < .001$), anxiety ($r = 0.20$, $p = .02$), and substance abuse symptoms ($r = 0.18$, $p = .03$). Conversely, there was a significant correlation between change in positive urgency and change in substance abuse among women ($r = 0.23$, $p < .01$), with no significant correlations between positive urgency and symptoms in men ($ps > 0.15$). Where men and women differed in these analyses, Fisher *r* to Z transformations were used to compare correlation coefficients between men and women. These analyses showed no differences in the size of correlations with the exception of change in negative urgency and change in depression, which remained larger among men, $z = 2.27$, $p = .02$.

4. Discussion

Urgency is a robust transdiagnostic feature of psychopathology, yet very little is known about the effectiveness of current treatments for this pervasive type of impulsivity. This study provides evidence that the tendency to respond impulsively to both negative and positive mood states decreases significantly during naturalistic, intensive CBT-based treatment in a partial hospitalization program. Although significant, the magnitude of change in urgency scores was relatively modest. These changes were documented using both pre- to post- analyses, and growth modeling analyses including all timepoints and participants. However, we also found that higher baseline levels of negative urgency predict worse treatment outcome for depression and anxiety symptoms. Contrary to predictions, positive urgency was not a significant predictor of treatment outcome.

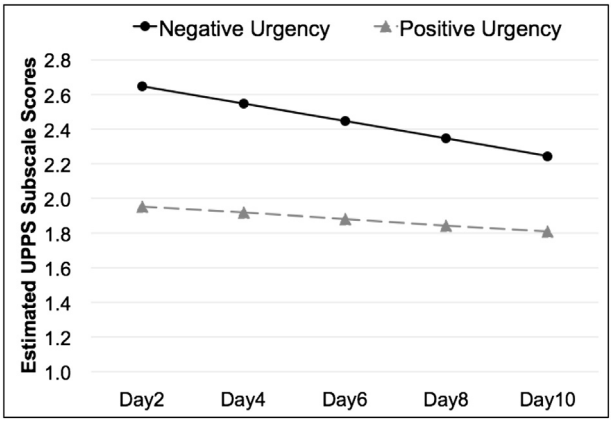

Fig. 1. Trajectory of change of negative and positive urgency. Note. "Day" on the x-axis refers to day of treatment.

One primary finding of this investigation is that negative urgency predicts worse treatment response for depression and anxiety symptoms. Consistent with findings reported in substance use disorders [23] and binge eating disorder [22], these results add to a growing literature indicating that impulsive responses to negative emotion are a significant predictor of treatment response. Although a test of the mechanisms of this finding are outside of the scope of this study, there are several possible explanations for why negative urgency is associated with worse treatment outcomes. Broadly, a tendency to react quickly to negative mood might make it challenging to learn CBT and DBT-based skills that emphasize awareness of thoughts and behaviors during strong emotions. That is, rapid behavioral responses to negative affect states might detrimentally coincide with the same moments in which awareness of thoughts and emotions might be most important.

A more specific explanation for the influence of urgency on post-treatment outcomes could be that the neurocognitive mechanisms underlying urgency might themselves contribute to poorer treatment outcome. Urgency is correlated with deficits in prepotent response inhibition (i.e., the ability to suppress a dominant response [42,43], which in turn have been linked to symptoms of depression and anxiety [44,45]. Thus, elevations in urgency and weaknesses in response inhibition might jointly or independently predict poor treatment outcome. More research is needed to test these potential explanations.

In contrast, positive urgency did not predict treatment outcome. Specifically, positive urgency did not predict higher scores on the BASIS-24 scales assessing substance use problems and self-harm/suicidal ideation at discharge, despite some baseline correlations observed between these variables. The use of four and two-item scales, respectively, to assess these symptoms leaves the possibility that positive urgency may yet be correlated with other aspects of substance use or self-harm not captured by these brief measures. Participants in this study also endorsed low rates of substance use problems and self-harm/suicidal ideation at discharge, limiting the ability of our analyses to detect potential influences of positive urgency. Although closely correlated with negative urgency [4], positive urgency has also been identified as a correlate of specific symptoms and behaviors, such as bipolar disorder [12], problems with alcohol use [46], and risky sexual behavior [20]. Average scores on the Positive Urgency measures were lower than those for Negative Urgency in the present study; it is possible that

positive urgency may be more relevant for treatment outcomes in these specific populations.

Beyond the prediction of treatment outcome, this investigation provides the first evidence outside of substance use and binge eating disorder that negative urgency decreases in the context of intensive psychiatric treatment. Given that negative urgency has been identified as a prospective predictor of depression and self-injury [18,19], and as a cross-sectional correlate of a wide range of mood, anxiety, and personality disorders [6], results suggest that there may be reason to be hopeful about the potential for some current treatments to address impulsive reactivity to negative mood. Post-hoc analyses also yielded small, significant correspondence between change in urgency and change in symptoms. Caution is warranted, however, in that symptoms and urgency were assessed over a relatively short period of time and did not include follow-up assessment. More research is also clearly needed to assess how decreases in urgency drive could influence in specific aspects of psychopathology.

Results of growth modeling indicated a linear decrease in negative and positive urgency over the course of treatment. If replicated with more stringent conditions, this finding could indicate that the intensive daily treatment provided in partial hospital settings supports cumulative, progressive decreases in urgency. Given that daily change in urgency has not been previously assessed in this way, it is not clear if such linear decreases are attributable to the intensity and frequency of partial hospital treatment, or if such decreases would also observed in less intensive treatment settings such as outpatient clinics. Although interpretation of this finding is limited by the lack of a no-treatment control condition and the lack of follow-up assessment to probe the durability of these changes, it is notable that urgency is conceptualized as a personality trait [2] and has been identified as a stable construct over much longer periods of time than the duration of this study [17,47].

In the present study, the magnitude of change in negative urgency was comparable to decreases reported in several previous studies in substance abusing samples [23,26], providing more evidence that individuals assessed during the course of treatment report decreases in negative urgency. Together with the results of these previous studies, mounting evidence suggests there is some degree of change in how people rate their level of urgency while receiving clinical interventions. If the urgency scales do indeed reflect an aspect of personality, then these traits may be somewhat more reactive to external variables than previously assumed. Yet, particularly given the lack of follow-up, these findings do not necessarily show that personality traits are truly malleable. It is possible that repeated practice with completing the urgency scales, demand characteristics related to participation in treatment, or simply regression to the mean are responsible for some or all of these changes. It is also important to note that the magnitude of change in urgency scores, although significant, was not particularly large; similarly, the magnitude of change between urgency scores and symptoms were small. The degree of change in negative urgency was less than one-half of a point on the urgency scale, with even smaller changes observed for positive urgency. More research is needed to understand the degree to which this change is durable over longer periods of time and to understand if the observed decreases in urgency are attributable to treatment.

Positive urgency also decreased over the course of treatment. Although this finding is consistent with hypotheses in the present study, and with a previous finding in a non-clinical sample [27], it contrasts with several previous studies conducted in substance use disorder samples, which have not observed changes in positive urgency during treatment, even as negative urgency subsides [23,26]. An important goal for future research will be to determine which aspects of treatment (if any) are related to decreases in this trait, and to evaluate specific mechanisms that help both negative and positive urgency to subside. For example, urgency is somewhat correlated with related constructs such as distress tolerance [48,49], as well as with negative affect more broadly [4]. Difficulties tolerating distress also decrease during partial hospital treatment [50], so it is possible that improvements in urgency are mediated by improvements in distress tolerance or other similar mechanisms.

Post-hoc analyses suggested that the magnitude of change in urgency scores were positively correlated with magnitude of change in most symptoms assessed. These analyses were qualified by evidence of a significant sex difference, with a significantly stronger correlation between change in negative urgency and change in depression among men. Caution is warranted in interpreting these findings given their post-hoc nature and given the small magnitude of correlations between symptom change and urgency. Nonetheless, these findings support the need for additional research on the mechanisms by which urgency might contribute to symptom change (and vice versa), and how sex differences might influence this process.

A primary limitation of this study is the lack of a control condition. All individuals in this study received similar treatment, so without a control or comparison group, it is difficult to conclusively say that participation in treatment influences urgency scores. If treatment did indeed affect urgency, it is unclear at this stage which components of treatment (medication changes, types of therapy, etc.) may have been responsible for producing this change. Findings are also limited by the potential for selection bias, given that many eligible participants did not complete the study. Further, analyses of change in the BASIS self-harm scale are limited by the finding that participants with higher self-harm scores were less likely to have complete data at discharge. Another primary limitation is the reliance on self-report measures. Due to the need for brevity in naturalistic, acute treatment settings, many of these measures were short and did not assess constructs as thoroughly as some previous studies conducted in laboratory studies or in less acute treatment samples. Also, study included both daily (24-h) and "general" measures of the UPPS urgency constructs, which limits our ability to directly compare change in negative and positive urgency across the baseline, interim, and discharge timepoints. Finally, due to the demographics of the partial hospital program, our sample was both highly educated and lacking sufficient numbers of individuals identifying as ethnoracial minorities; thus, we are unable to test whether the obtained effects are similar across individuals of different backgrounds, identities, and socioeconomic status. The present investigation did not address the question of whether reductions in urgency differentially predict treatment outcomes for different types of individuals (such as patients differing in diagnosis or treatment history)—these questions are important goals for future research.

4.1. Conclusion

Impulsive behavior in response to strong emotion is a very common, maladaptive feature in many types of mental illness. This study demonstrates that despite the pervasive nature of urgency, people with acute symptoms of mental illness show significant declines in negative and positive urgency during a brief, intensive naturalistic partial hospitalization program. However, despite this intensive treatment, negative urgency is a significant predictor of depression and anxiety symptoms at discharge. Future studies should evaluate the impact of specific treatment components on urgency, and continue developing novel treatment strategies to target urgency across disorders.

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