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Research paper

Day-to-day changes in negative attributions of stress: A daily diary study of cognitive vulnerability and negative affect in adults with elevated risk of suicidal thoughts and behaviors

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ABSTRACT

Background: The hopelessness theory is one of the most studied cognitive vulnerability theories of depression. It proposes that risk for depression is conferred by attributing the causes of negative events to global, internal, stable causes and inferring future negative consequences and negative characteristics about oneself from these events. Nearly all research has operationalized cognitive style using individuals' responses to hypothetical events at single timepoints. Far less research has explored attributions of specific events as they occur, none of which has involved clinical samples.

Methods: This study aimed to examine if measuring event-specific attributions clarifies the relationship between negative cognitive style and clinical symptoms. Adults ($n = 51$), who had attempted suicide at least once in the year prior, were recruited from the community via online forums related to suicide risk. Participants provided nightly ratings of hopelessness and attributions of the most stressful event that day for four weeks.

Results: The daily diary composite measure of cognitive style was more strongly associated with hopelessness and depressive symptoms than the trait measure. Daily attributions fully mediated the relationship between trait cognitive style and hopelessness.

Limitations: The measurement period could not capture the occurrence of a next depressive episode for all participants. Relatedly, we could not account for the precise nature of individual stressors.

Conclusions: At a population level, trait measures alone may be a useful risk factor. But, with the goal to move towards more personalized prediction and intervention, more dynamic, ecologically valid, and real time measures may help gain more traction.

1. Introduction

Negative cognitive style is one of the most studied and replicable risk factors for depression. This cognitive vulnerability is the tendency to attribute negative events to global, internal, stable causes and to infer that the event will lead to negative future consequences and reflects negative characteristics about oneself (Abramson et al., 1989, 1999). Empirical evidence shows that negative cognitive style is cross-sectionally associated with elevated feelings of hopelessness, depressed mood, major depression, and suicidal thoughts and behaviors (Alloy et al., 1999; Hu et al., 2015). Furthermore, this disposition prospectively predicts the development of depressive symptoms, disorders, and suicidal thoughts and behaviors (Abramson et al., 1998; Alloy et al., 2006; Gibb et al., 2006).

Negative cognitive style is a central component of the hopelessness theory of depression (Abramson et al., 1989). Hopelessness theory describes how the interaction of negative cognitive style and negative life events leads to depression. More specifically, problematic appraisals of a specific negative event or set of events causes feelings of hopelessness and subsequently depression (Joiner, 2001; Metalsky and Joiner, 1992) or suicidal thoughts and behaviors (Abramson et al., 1998; Smith et al., 2006).

Although trait or dispositional measures of negative cognitive style have demonstrated predictive power, the strongest predictors of

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depressive symptoms are thought to come from attributions of specific events *as the events occur* (Liu et al., 2015). Thus, there is a mismatch between the theory, which highlights the role of event-specific attributions, and the empirical work that has been conducted to test it, which focus on trait measures of attributions for hypothetical and generic events. Studies that assess only trait-level attributions may miss important predictive nuances in the relationship between negative cognitive style and outcomes like depressive symptoms. The goal of this paper is to examine if measuring event-specific attributions does indeed increase our ability to understand the nature of negative cognitive style above and beyond trait measures.

1.1. Why is it important to assess event-specific attributions?

Traditionally, negative cognitive style is operationalized via responses to a series of hypothetical negative events (e.g., end of a romantic relationship, professional failure). This measure is administered separately from the occurrence of actual negative events in respondents' lives. It is largely unknown: (a) how participants' reports of the causes and consequences of hypothetical events map on to their reports of the causes and consequences for actual events, as these events occur and (b) whether assessing the causes and consequences for events as they occur provides more information about risk for depression above and beyond the typical measure. Across psychology, there has been a recent shift towards more idiographic, ecologically valid, and dynamic measures that better capture our phenomena of interest as they occur in real time. There is longstanding interest in how individuals at risk for or with depression perceive stressors, with increasing attention paid to real-time perceptions and consequential responses. For example, in a daily diary study, Kreitz and colleagues recently found that compared to individuals who were not depressed, individuals presenting with current major depression describe everyday events with less positive and more negative words, consistent with a bias toward perceiving everyday occurrences as more stressful than peers (Kreitz et al., 2020). In line with this recent shift, this project examines individuals' responses to hypothetical negative events as well as event-specific appraisals in their daily lives. The goal was to determine whether assessments of events as they occur in real-life improve our understanding of how negative cognitive style confers risk for hopelessness and depressive symptoms.

Some work has been conducted to address this goal. To our knowledge, however, it has been exclusively with nonclinical student samples. The earliest example is Metalsky and colleagues (1987) who recorded college students' responses to failing an exam. Measures included a traditional cognitive style measure prior to the exam, global and stable attributions immediately after the failure, and depression symptoms measured immediately after the failure and a few days later. Whereas attributions of the failure itself uniquely predicted change in symptoms that day, negative cognitive style uniquely predicted changes in symptoms a few days after (Metalsky et al., 1987). In a similar prospective design using three time points, Hong and colleagues found that event-specific appraisals mediated the relationship between negative cognitive style and hopelessness and subsequently depression; importantly, negative cognitive style was not a significant predictor independent of event-specific measures (Hong et al., 2006).

A few other studies employed daily diary measures and captured responses to more than one negative event for each participant. Swendsen examined stability and globality attributions over the course of a week. Whereas the baseline measure of negative cognitive style (i.e., trait negative cognitive style) was a significant predictor of these event-specific attributions, only the latter explained variability in depressive symptoms throughout the study period (Swendsen, 1998). Hankin and colleagues built on this work to include attributions related to negative future consequences and negative inferences about the self, in addition to stability and globality ratings, as a single composite score in a daily diary study (Hankin et al., 2005). Data showed that both dispositional and event-specific attributions, as well as an interaction between the two, predicted depressive symptoms. Furthermore, event-specific responses mediated the association between negative cognitive style and daily depression symptoms. Russell and colleagues found that daily negative cognitions predicted hopelessness, which was a significant mediator of depression on the following day. Suggesting directionality of this relationship, the opposite direction of prediction, i.e. hopelessness predicting negative cognitions, was not significant (Russell et al., 2014).

Taken together, there is some evidence that assessing attributions in daily life may provide additional, clinically valuable information in predicting shifts in individuals' mood states. However, no studies have examined this question in a high risk population. It is possible that findings do not generalize beyond unselected college students. It is also possible that the limited ability of dispositional negative cognitive style measures to account for changes in mood at the individual level is an artifact of the samples. Limited or inconsistent findings may be due to floor effects; there may not be sufficient variability (particularly at the severe end) in negative cognitive style, the occurrence of stressors, and the experience of depression to reveal small effects.

1.2. The present study

In this study, we build on prior work by measuring appraisals of real events in daily life in a high risk sample. Participants were individuals with a history of suicide attempts within the past year, suggesting elevated vulnerability for experiencing recurrences of hopelessness, suicidality, and depression. Being able to identify meaningful changes in cognition and mood in this population could have high clinical impact. We also used daily measures of hopelessness, a key mediator in hopelessness theory's causal chain (Hong et al., 2006). Furthermore, hopeless itself is a strong predictor of severity and chronicity of mental illness, suicide attempt, and a host of other adverse health outcomes (Pompili et al., 2013; Abramson et al., 2002; Serafini et al., 2020). The study had three primary aims concerning how people appraise negative events *in general* and how they appraise *specific* negative events at single time points. The first aim was to test whether these patterns of appraisals for hypothetical negative events (i.e., dispositional measure of negative cognitive style) would be similar to patterns for real negative events. We expected significant correlations, consistent with findings from healthy groups. The second aim was to examine the stability of daily attributions; we were interested in whether between-person or trait-like differences versus event-specific, within-person variability better accounts for interpretations of stressors. Past work in college students suggests the former (Hankin et al., 2005). However, as noted above, this could be due to the nature of the sample. The third aim was to evaluate whether measuring real life attributions could improve our prediction of hopelessness.

2. Methods

2.1. Subjects

Participants ($n = 51$; $M_{age} = 23.4$, $SD = 4.4$) were recruited from online forums related to suicide risk as part of a larger study (Kleiman et al., 2017). Although participants overlap with this prior study, the data in this manuscript have not been previously published. An additional five individuals enrolled in the study, but were not included as they did not provide any daily diary entries ($n = 2$) or only one daily diary entry ($n = 3$). We excluded participants with only one diary entry because we conducted some analyses with participant-centered data and >1 response is required for centering in this manner. Eligibility criteria included: (1) attempting suicide at least once in the past year and (2) having access to a compatible iOS or Android smartphone. Within the current sample, 39 participants identified as female (76.4%), eight as male (15.7%) and four as other gender (7.9%). Thirty-six individuals identified as white (70.6%), four as Asian (7.8%), four as Black (7.8%),

and seven as other race (13.7%). The modal number of past-year suicide attempts was 1, although 47.1% of the sample ($n = 24$) attempted suicide more than once in the past year (most of whom [17 out of 24] did so twice). Informed consent was obtained from all individual participants included in the study.

2.2. Procedure

The study was conducted entirely online. All study procedures were approved by the institutional review board at Harvard University. After electronically signing the consent form, participants completed a battery of baseline questionnaires, including the trait measure of cognitive style, and received instructions for using the daily diary software. Over the course of four weeks, participants completed daily diary measures assessing the day's events, their attributions, and level of hopelessness through the smartphone application platform.

2.3. Materials

2.3.1. Baseline questionnaires

Cognitive Style Questionnaire—Short Form (CSQ-SF) (Meins et al., 2012). CSQ-SF is an abbreviated version of the Cognitive Style Questionnaire (CSQ) (Haeffel et al., 2008) with demonstrated satisfactory internal and test-retest reliability. Like the full CSQ, the CSQ-SF measures individuals' styles for inferring causes, consequences, and self-characteristics for hypothetical scenarios. Unlike the full CSQ which includes 24 vignettes, 12 of which are about negative events, the CSQ-SF uses eight vignettes reflecting four negative interpersonal events (e.g., wanting to be in a romantic relationship but not being in one) and four negative achievement-oriented events (e.g., negative performance review at work). Participants rated the imagined cause of each vignette on the dimensions relevant to the hopelessness theory: how much it is one's own fault versus others' (internality; 2 items per vignette), how much it will affect one or many areas of one's life (globality; 2 items), how likely it is to persist over time (stability; 2 items) how likely it is to lead to additional negative consequences in the future (consequences; 1 item), and how much it indicates negative characteristics about the self (self; 2 items). In order to match constructs from this measure with the factors assessed in the daily diary portion, we used only the globality, consequences, and self-components of the measure. We extracted average scores across vignettes for each of these three components to create an average composite score. Scores could range from 1 (least negative bias) to 7 (most negative bias). Reliability scores for this measure are included in Table 1.

Brief Symptom Inventory (BSI-18) (Derogatis, 2000). We used the depression and anxiety subscales of the BSI to assess severity of depression and anxiety symptoms. Six items assess each construct. Participants rate the extent to which they are experiencing or troubled by a series of symptoms on a scale from 0 (not at all) through 4 (very much). Example items include feeling blue and feeling tense. Items from each subscale are averaged. In the current sample, mean BSI-depression score was 2.3 ($SD = .1$) and mean BSI-anxiety score was 2.9 ($SD = .8$).

Daily diary software. We utilized the Mobile Ecological Momentary Assessment (mEMA; http://mobileema.com/) software to collect longitudinal data. mEMA is a data collection program that runs on iPhone and Android smartphones and is fully HIPAA compliant. Participants received nightly prompts (at 9pm local time) to compete the daily diary measure and were allotted two hours for completion.

Daily diary (DD) measures. Each night, participants were presented with a list of 17 negative events that could occur on a daily timescale (e.g., argument with significant other, being late to an appointment). Participants indicated which events occurred that day and then selected the stressor that was most negative for them and answered four subsequent questions about it. Follow-up questions were in the same format as the CSQ-SF and included globality ("Will this event lead to problems just in this instance or will it lead to problems in other areas of your life?"), consequences ("How much do you believe this negative event will lead to other negative events in the future?"), and self ("To what degree does this mean that you are flawed in some way?"). The participants also had an option to select "none" under the event list, and in that case were not presented with any follow-up questions. This approach was based on the Particular Inferences Questionnaire (Metalsky et al., 1987) and daily diary procedure in Hankin et al. (2005). We computed average scores across days for each of these three components as well as an average composite score. Finally, participants were asked to rate how hopeless they felt overall that day. All questions were on a 1 (not at all) to 5 (very much) scale. Reliability scores for this measure are included in Table 1.

2.4. Data analysis

2.4.1. Descriptive statistics

Means and standard deviations for each cognitive style measure at baseline (i.e., CSQ-composite, CSQ-global, CSQ-consequences, CSQ-self) and during the daily diary period (i.e., DD-composite, DD-global, DD-consequences, DD-self) were computed. We estimated Cronbach's α values for internal consistency.

2.4.2. Associations between baseline and daily measures cognitive style

To explore similarities between traditional measures of cognitive vulnerability (i.e., CSQ-SF) and daily attributions (i.e., DD), we first computed average cognitive style scores and hopelessness ratings for the daily diary period and examined pairwise correlations between CSQ-SF scores, DD scores, BSI-depression, and DD-hopeless (average daily hopelessness rating).

2.4.3. Variability in cognitive style

We also computed intraclass correlation coefficients (*ICCs*) for each cognitive style measure at baseline (i.e., responses to 8 hypothetical events) and during the daily diary period. This measure captures within- and between-person variability in appraisals of hypothetical (CSQ-SF) and daily negative events (DD). Small *ICC* values indicate high within-person variability relative to between-person variability. For example, a small *ICC* value for CSQ-SF suggests that individuals are changing the extent to which they judge negative events to be caused by global (vs. specific) factors from one hypothetical event to another, whereas a small *ICC* value for DD-global suggests that individuals are changing the extent to which they judge negative events to be caused by global (vs. specific) factors day-to-day. Large *ICC* values indicate high between-person variability relative to within-person variability; for example, this could reflect individuals rigidly interpreting the causes of each day's negative events as highly global or specific. In this case, there would be high variability between people, as some people would consistently make strong global attributions and others would consistently not.

Table 1
Dispositional and daily measures of cognitive vulnerability.

Cognitive Style Measure	Cronbach's α	*Between-subject ScoreM (SD)*	*Within-subjectVariabilityM (SD)*	*ICC*
CSQ-SF				
Composite	.93	3. 9 (0.6)	.87 (0.2)	.28
Global	.80	3.8 (0.6)	.89 (0.3)	.25
Consequences	.71	3.8 (0.7)	.83 (0.4)	.26
Self	.90	4.2 (0.7)	.67 (0.4)	.43
DD				
Composite	.85	3.5 (0.9)	1.0 (0.4)	.35
Global	.76	3.2 (1.0)	1.2 (0.4)	.30
Consequences	.79	3.5 (0.9)	1.1 (0.4)	.29
Self	.86	3.7 (1.0)	1.1 (0.5)	.35

Note. CSQ-SF = Cognitive Style Questionnaire-Short Form. DD = daily diary.

2.4.4. Associations between cognitive style and hopelessness

We fit a series of linear regressions (random intercept models) to assess whether average daily measures of cognitive style related to reports of hopelessness (average of daily ratings) above and beyond covariates of baseline trait measures of cognitive style (CSQ-SF) and other emotional symptoms (BSI-depression, BSI-anxiety). In the event of positive results, we planned to test for mediation effects. Indirect effects would be tested using a bootstrap estimation approach with 1000 samples. Finally, we sought to further capitalize on the daily diary structure of the data as the above models only examine between-person aspects of daily cognitive style and daily feelings of hopelessness (i.e., average ratings). We computed a series of multilevel models in which between-person and within-person (daily ratings, person mean centered) factors could be evaluated as unique predictors of daily hopelessness. All analyses were conducted using *R* software.

3. Results

3.1. Descriptive statistics

A total of 625 daily diary entries were recorded by the 51 participants. Participants individually completed an average of 12.3 entries ($SD = 9.3$) and endorsed, on average, 2.12 negative events per day (SD = 0.95). Participants' average daily hopelessness ratings ranged from 1.28 to 5 (maximum possible; $M = 3.52$, SD = 1.01). Means and standard deviations of cognitive style measures are included in Table 1. Measures of each cognitive style domain had acceptable internal consistency (Cronbach's $\alpha s > .70$). Before proceeding with analyses, we checked for patterns of missingness. Within completed daily diaries, there was no relationship between missing hopelessness ratings and cognitive style ratings. And overall, rates of missing daily diary entries were not associated with race, gender, BSI-depression, BSI-anxiety, CSQ-SF scores, DD scores, or average hopelessness ratings. Subsequent analyses utilize listwise deletion as well as maximum likelihood to generate parameter estimates that are unbiased in cases when missingness is missing at random or completely random, consistent with our observed data.

3.2. Associations between baseline and daily measures cognitive style

We computed Benjamini-Hochberg adjusted correlations between CSQ-SF and DD component scores. Overall, although virtually all measures were significantly intercorrelated, the largest correlations tended to be within measure (i.e., among CSQ-SF components) rather than by individual component (i.e., CSQ-global with DD-global). CSQ-global was only moderately correlated with average daily diary global attributions (DD-global) as was CSQ-consequences with DD-consequences. The correlation between the CSQ-self and DD-self was large. Full results for correlation analyses are included in Table 2.

3.3. Variability in cognitive style

ICC values were $\leq .30$ for measures of globality and consequences at baseline (CSQ-SF) and during the daily diary period (DD), suggesting more within-person variation than between-person variation in responses. *ICC* values were .43 and .35 for measures of self at baseline and during the daily diary period respectively. Table 1 includes full results and Fig. 1 example plots of variability in daily composite cognitive style scores.

3.4. Associations between cognitive style and mean feelings of hopelessness

3.4.1. Correlations

Most DD and CSQ-SF measures were significantly correlated with BSI-depression and DD-hopeless (see Table 2). Measures having strongest associations with BSI-depression were DD-consequences and DD-global. Measures having the strongest associations with DD-hopeless were DD-self and DD-consequences. Overall, DD-composite was strongly associated with both BSI-depression and DD-hopeless.

3.4.2. Linear regressions

In the following models, variance inflation factor (VIF) values were ≤ 1.5, suggesting that multicollinearity was not a significant issue. Across cognitive style components, CSQ-SF measures were significant, unique predictors of average daily reports of hopelessness (see Table 3). Model comparisons via ANOVA testing showed that adding the corresponding DD measure to each model consistently improved model fit, $ps < .05$. Additionally, DD measures remained significant predictors of hopelessness even when BSI-depression and BSI-anxiety were included as covariates, $ps < .05$.

3.4.3. Mediations

For each cognitive style component, mediation paths *a* (e.g., CSQ-composite predicting DD-composite), *b* (e.g., DD-composite predicting hopelessness), and *c* (e.g., total effect; CSQ-composite predicting hopelessness) were significant. Additionally, bootstrap mediation analyses revealed significant indirect effects (average causal mediation effect; ACME), but no significant direct effects (*c'* path; e.g., CSQ-composite predicting hopelessness with DD-composite as a mediator), suggesting full mediation. Full mediation results are reported in Table 3.

3.5. Associations between cognitive style and daily feelings of hopelessness

Finally, multilevel models (random intercept) allowed us to test the predictive power of daily cognitive style ratings at both between- (i.e., average rating) and within-person (i.e., daily rating) levels and to examine daily hopelessness ratings. Full results are included in Table 4. For all cognitive style components, models including CSQ-SF, DD, and person mean-centered daily ratings as predictors of daily hopelessness provided the best fit relative to models including only CSQ-SF and DD

Table 2
Pairwise Pearson correlations.

		Composite	Global		Consequences		Self		BSI-depression	DD-hopeless
		CSQ-SF	DD	CSQ-SF	DD	CSQ-SF	DD	CSQ-SF		
Composite	**DD**	.50**	.90**	.50**	.96**	.46**	.83**	.43*	.42*	.58**
	CSQ-SF		.35*	.93**	.45*	.90**	.56**	.90**	.36*	.38*
Global	**DD**			.35*	.88**	.32*	.55**	.28	.40*	.40*
	CSQ-SF				.45*	.78**	.55**	.79**	.35*	.42*
Consequences	**DD**					.42*	.70**	.37*	.48**	.54**
	CSQ-SF						.49**	.66**	.29*	.40*
Self	**DD**							.51**	.26	.63**
	CSQ-SF								.33*	.31*
	BSI-depression									.29*

Note. *p < .05, **p ≤ .001. p-values reflect Benhjamini-Hochberg adjusted values. DD = daily diary. CSQ-SF = Cognitive Style Questionnaire-Short Form.

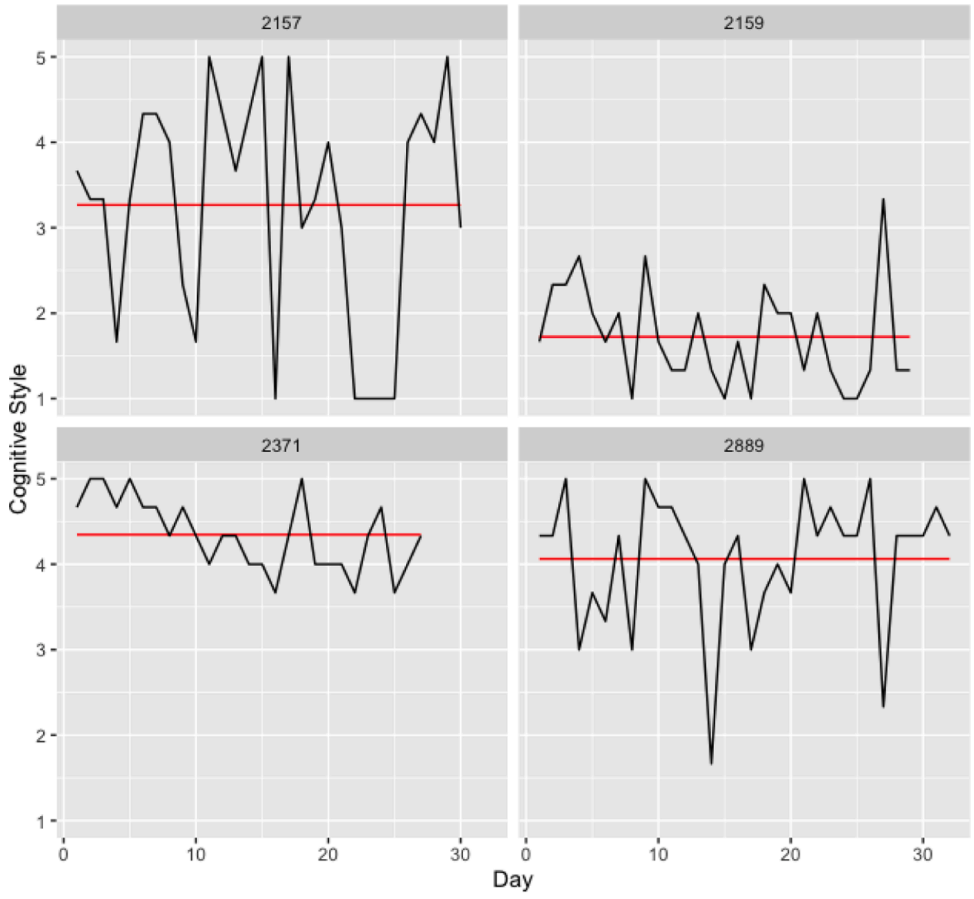

Fig. 1. Example plots of daily diary composite ratings of negative cognitive style
Note. Black lines depict a participant's daily ratings. Red lines depict a participant's average rating from the entire study period. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

measures or CSQ-SF measures alone. Across models, DD and person mean-centered daily ratings remained significant predictors. With the exception of CSQ-global, CSQ-SF measures were only significant when included as sole predictors.

4. Discussion

This study compared how individuals with a recent history of suicidal behavior appraise negative events *in general* (trait or dispositional negative cognitive style) to how they appraise *specific* negative events at single time points (state or situational attributions). Overall, the daily diary composite measure of cognitive style was more strongly associated with average levels of daily hopelessness and baseline depressive symptoms than the trait measure. Furthermore, the daily diary composite measure was positively associated with hopelessness and effects of the trait measure were fully mediated by these daily appraisals; this pattern held for individual component scores as well (globality, consequences, self). Results from the multilevel models also suggest that a person's unique rating on a given day is informative above and beyond their average daily ratings and the trait measure. These results are, in many ways, unsurprising as they fit with the larger hopelessness theory— that hopelessness and subsequently depression result from the occurrence and appraisals of happenings in people's real lives (Joiner, 2001; Metalsky and Joiner, 1992) and that changes in mood occur as individuals believe negative events to portend broader and continued problems and to reflect their own deficiencies. Findings further align with prior evidence that real-world appraisals mediate the relationship between trait measures of cognitive style and hopelessness or depression (Hankin et al., 2005; Hong et al., 2006). It should be noted that we did not test the interaction between attributions and specific stressful events as the attribution themselves denote the occurrence of a stressor.

Although baseline and daily appraisals were correlated, associations were modest and the stronger correlations were within measure. For example, daily measures of globality were more strongly related to daily measures of negative consequences than to dispositional measures of globality. This is the first piece of evidence that individuals could be changing their appraisals day to day. In other words, how people think they would react to stressors does not necessarily match their real-time responses. This is consistent with past work showing that although trait measures may predict event-specific attributions, correspondence, and thus impact, is not one-to-one (Swendsen, 1998). Additionally, *ICC*s revealed significant within-person variation relative to between-person variation, particularly for global and negative consequence appraisals. This is further evidence that the use of average ratings could be occluding meaningful variability in day-to-day responses to stress. This finding also supports the use of daily diary methodology, which is a time- and resource-consuming methodology that should only be used if the constructs being measured warrant such a methodology. Future work could more rigorously explore sources and consequences of such variability. For example, identifying particularly domains (e.g., social) or times of day that tend to correspond with more negative appraisals could direct more targeted interventions, or even noting changes in typical patterns could lead to improved prediction. However, these results also merit replication first. Notably, Hankin and colleagues (2005) reported that daily appraisals among college students exhibited moderate stability across time and were better accounted for by a trait-like model than a contextual one. Thus, it is important to find out whether this discrepancy is attributable to the present study comprising an at-risk

Table 3
Mediation of daily diary measures (DD) in the relationship between trait cognitive style (CSQ-SF) and average daily reports of hopelessness.

Regression paths (Composite)	Estimate	Statistic	*Adjusted* R^2	*p*
Mediation (*a*)	0.50	16.7	.24	<.001
Mediation (*b*)	0.68	24.93	.32	<.001
Total effect (*c*)	0.65	8.48	.13	.005
		CI Lower	**CI Upper**	
Direct effect (*c'*)	0.12	-0.20	0.42	.45
Indirect effect (*c - c'*)	0.26	0.12	0.43	<.001
Proportion mediated	0.68	0.25	2.41	.03
Regression paths (Globality)	**Estimate**	**Statistic**	***Adjusted*** R^2	***p***
Mediation (*a*)	0.36	6.81	.11	.01
Mediation (*b*)	0.40	9.44	.15	.003
Total effect (*c*)	0.71	10.12	.16	.003
		CI Lower	**CI Upper**	
Direct effect (*c'*)	0.28	-0.06	0.56	.11
Indirect effect (*c - c'*)	0.11	0.01	0.27	.02
Proportion mediated	0.28	0.03	1.36	.03
Regression paths (Consequences)	**Estimate**	**Statistic**	***Adjusted*** R^2	***p***
Mediation (*a*)	0.42	10.67	.16	.002
Mediation (*b*)	0.61	20.01	.28	<.001
Total effect (*c*)	0.58	9.08	.14	.004
		CI Lower	**CI Upper**	
Direct effect (*c'*)	0.18	-0.18	0.46	.28
Indirect effect (*c - c'*)	0.21	0.08	0.36	<.001
Proportion mediated	0.54	0.14	2.07	.04
Regression paths (Self)	**Estimate**	**Statistic**	***Adjusted*** R^2	***p***
Mediation (*a*)	0.51	17.62	.25	<.001
Mediation (*b*)	0.66	31.81	.38	<.001
Total effect (*c*)	0.45	5.24	.08	.03
		CI Lower	**CI Upper**	
Direct effect (*c'*)	0.05	-0.27	0.35	.74
Indirect effect (*c - c'*)	0.34	0.15	0.54	<.001
Proportion mediated	0.88	0.33	3.61	.02

Note. *a* = CSQ-SF on DD; *b* = DD on hopelessness; *c* = CSQ-SF on hopelessness without mediator; *c'* = CSQ-SF on hopelessness with mediator; *c - c'* = average causal mediation effect (ACME); CI = 95% confidence interval.

sample, whether there is some other moderating variable providing nuance to these findings, or whether one finding is a false positive.

It is also important to note some limitations of this protocol. Although the study includes a clinical sample, the measurement period could not necessarily capture the occurrence of stressors significant enough to lead to a depressive episode for all participants. In this way, it is not a perfect test of the hopelessness theory of depression. This is an issue that would be faced by any study assessing the occurrence of unpredictable events. In other words, it would not be possible to specifically capture all possible events that someone could experience in any given day. Relatedly, the nature of individual stressors could not be accounted for in analyses, nor was a control group included for comparison. In this way results complement past studies, such as Metalsky et al. (1987), holding the nature of the stressor constant across participants (e.g., failing an exam). An important future direction would be to consider the most stressful event as well as cumulative stress experienced within a day and across time. Moreover, consideration of positive or event neutral events would add further insight into how cognitive-affective biases influence daily experiences; for example, individuals experiencing depression are frequently *more* reactive than others to positive events, suggesting that biased appraisals could be implicated (e.g., Bylsma et al., 2011). And though the daily diary approach is arguably less burdensome that repeated measures throughout the day, it also bears the caveat that reported appraisals could be affected by biases or errors in recall due to assessments not being administered until the end of each day. Additionally, the brief daily measure did not include all possible facets of cognitive style. Thus, the current results should be interpreted as the first of many iterations needed to fully understand the promise of measuring negative cognitive style in daily life.

In conclusion, more work is needed to examine appraisals of real life events—both general trends and day-to-day variability. Results suggest that even within this sample of at-risk individuals, a number of whom reported feeling depressed at study entry, people are not rigidly interpreting negative events as global, consequential, and self-referential. Indeed, the greatest risk for depression may come from the persistence or accumulation of problematic inferences over time. Results add to a growing literature suggesting that at a population level, trait cognitive style alone may be a useful risk factor. But, if the goal is to move towards more personalized prediction and intervention, ecological momentary assessment and daily diary types of assessments may help us gain more traction.

Table 4
Summary of multi-level models with daily hopelessness as the criterion variable.

Variable (Composite)	Model 1			Model 2			Model 3		
	Estimate	95% CI	*p*	Estimate	95% CI	*p*	Estimate	95% CI	*p*
CSQ-composite	0.68	[0.23, 1.12]	.003	0.21	[-0.24, 0.66]	.37	.21	[-0.24, 0.66]	.37
DD-composite				0.65	[0.32, 0.98]	<.001	0.65	[0.32, 0.98]	<.001
Daily composite							0.41	[0.33, 0.49]	<.001
Marginal R^2		.09			.19			.26	
p for change in R^2					<.001			<.001	
Variable (Global)									
CSQ-global	0.75	[0.31, 1.19]	.001	0.52	[0.07, 0.97]	.02	0.52	[0.07, 0.97]	.02
DD-global				0.37	[0.09, 0.65]	.01	0.37	[0.09, 0.65]	.01
Daily global							0.28	[0.22, 0.35]	<.001
Marginal R^2		.11			.15			.20	
p for change in R^2					.01			<.001	
Variable (Consequences)									
CSQ-consequences	0.59	[0.20, 0.97]	.003	0.28	[-0.11, 0.66]	.17	0.28	[-0.11, 0.66]	.16
DD-consequences				0.56	[0.24, 0.87]	.001	0.55	[0.24, 0.87]	.001
Daily consequences							0.33	[0.26, 0.40]	<.001
Marginal R^2		.09			.16			.23	
p for change in R^2					.001			<.001	
Variable (Self)									
CSQ-self	0.49	[0.09, 0.88]	.02	0.03	[-0.36, 0.41]	.89	0.03	[-0.36, 0.41]	.90
DD-self				0.65	[0.38, 0.93]	<.001	0.65	[0.38, 0.93]	<.001
Daily self							0.30	[0.23, 0.37]	<.001
Marginal R^2		.05			.21			.27	
p for change in R^2					<.001			<.001	

Note. Daily ratings are person mean-centered. CI = confidence interval.

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CRediT authorship contribution statement

Emily E. Bernstein: Conceptualization, Formal analysis, Writing – original draft. **Matthew K. Nock:** Conceptualization, Methodology, Funding acquisition, Supervision, Writing – review & editing. **Evan M. Kleiman:** Conceptualization, Data curation, Funding acquisition, Methodology, Supervision, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no conflicts of interest.

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