

## The expression of affective temperaments in daily life

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### **Abstract:**

#### Background

Numerous validation studies have examined the TEMPS-A in both clinical and nonclinical samples. However, the majority of these studies utilized cross-sectional assessments in laboratory or clinical settings. The present study is the first to examine the expression of affective temperaments in daily life using experience sampling methodology (ESM).

#### Methods

138 participants completed the TEMPS-A and received a personalized digital assistant that signaled them eight times daily for one week to complete questionnaires that assessed affect, cognition, behavior, sense of self, and social interaction.

#### Results

As expected, cyclothymic/irritable temperament was positively associated with negative affect, risky behavior, and restlessness, and was negatively associated with positive affect and preference to be with others in daily life. In contrast, hyperthymic temperament was associated with positive affect, fullness of thought, doing many and exciting things, grandiosity, and preference to be with others in daily life. Dysthymic temperament was modestly associated with worry, and was positively associated with trouble concentrating, fullness of thought, and a preference for social contact. Cross-level interactions indicated that cyclothymic/irritable temperament was associated with elevated stress reactivity in daily life.

#### Limitations

ESM data collection was limited to one week. Longer assessment periods might better capture the cyclical nature of affective temperaments.

## Conclusions

This was the first study to examine affective temperaments in daily life. The findings offer further validation of the TEMPS-A, as well as the maladaptive nature of the cyclothymic/irritable temperament.

**Keywords:** affective temperament | TEMPS-A | experience sampling methodology | psychology

## Article:

### 1. Affective temperaments

Although the notion of affective temperaments dates back to antiquity, Kraepelin (1899, 1921) was the first to organize affective temperaments under the label of manic-depressive insanity. However, unlike current conceptualizations of bipolar disorder, manic-depressive insanity represented a continuum of symptoms that included “recurrent melancholia, mania, as well as subsyndromal fluctuations of activity, mood, and cognition between affective episodes” (Akiskal, 1996, p. 5S). Kraepelin posited that mood episodes arose from underlying affective temperaments in a cyclical nature. Specifically, Kraepelin suggested that affective temperaments occupy the intervals between mood episodes (Akiskal, 1996), but may also be present among individuals without full-blown mood disorders. Building on the historical foundation of Greek and German predecessors, Akiskal and Mallya (1987) operationalized, modified, and enriched Kraepelin’s formulations and specifically identified cyclothymic, dysthymic, and hyperthymic temperaments. Akiskal (2004) described hyperthymic temperament as characteristically upbeat and exuberant, with over-involvement in activities, high energy, confidence, and optimism, and less need for sleep. Dysthymic temperament was described as sensitive to criticism, self-blaming, and passive, whereas, cyclothymic temperament was characterized by frequent shifts in mood and energy. Among people exhibiting cyclothymic temperament, there appears to be an irritable subtype (Akiskal et al., 1979) characterized as critical, complaining, dissatisfied, and angry (Akiskal, 2004).

Numerous validation studies have examined affective temperaments in patients with mood psychopathology. Several studies have found higher rates of cyclothymic and irritable temperaments ( [Di Florio et al., 2010], [Dolenc, 2010], [Savitz et al., 2008], [Evans et al., 2005], [Mendlowicz et al., 2005], [Kesebir et al., 2005] and [Nowakowska et al., 2005]), as well as

dysthymic temperament ( [Evans et al., 2005], [Mendlowicz et al., 2005], [Nowakowska et al., 2005] and [Matsumoto et al., 2005]) in patients with bipolar disorders in comparison to healthy control participants. Similarly, Goto et al. (2011) found elevated rates of cyclothymic, irritable, and dysthymic temperaments in patients with bipolar spectrum disorders, in comparison to depressed patients. Two studies have reported associations between cyclothymic temperament and clinical markers of bipolarity ( [Maina et al., 2010] and [Mechri et al., 2011]). Research generally has not supported elevated rates of hyperthymic temperament in bipolar samples in comparison to healthy participants ( [Evans et al., 2005], [Savitz et al., 2008], [Mendlowicz et al., 2005] and [Nowakowska et al., 2005]), although one study (Kesebir et al., 2005) reported this trend. Two studies reported higher rates of hyperthymic temperament in bipolar patients in comparison to depressed patients ( [Mazzarini et al., 2009] and [Gassab et al., 2008]). Recently, Perugi et al. (2012) reported that affective temperaments may also influence the clinical features and course of bipolar psychopathology.

Recent work has also examined associations of affective temperaments in nonclinical samples. Maremmani et al. (2011) examined the relation of affective temperaments with affective state following a stressor in candidates for the Italian Air Force. Hyperthymic temperament was associated with feeling calm and peaceful following the stressor, and was negatively associated with feeling anxious. Conversely, cyclothymic temperament was positively associated with feeling anxious and agitated, and was negatively associated with feeling calm after the stressor. Irritable temperament was negatively associated with feeling well and peaceful, and dysthymic temperament was not associated with any measures of affect. Morvan et al. (2011) examined the relation of affective temperaments with self-report measures of anxiety and depressive symptoms in a large sample of undergraduate students. Cyclothymic, irritable, and dysthymic temperaments were associated with depressive and anxiety symptoms, whereas hyperthymic temperament was inversely associated with depressive symptoms. Similarly, Lazary et al. (2009) found that cyclothymic, irritable, and dysthymic temperaments were positively associated with current depressive symptoms in a nonclinical sample of Hungarian adults, and found an inverse association between hyperthymic temperament and depressive symptoms. Recently, Walsh et al. (2012a) reported that combined cyclothymic/irritable temperament was associated with bipolar disorders, borderline personality traits, and impairment in a nonclinically ascertained sample of young adults.

Overall, this body of research supports the construct validity of affective temperaments. However, this research has largely been limited to cross-sectional assessments in laboratory or clinical settings. Thus, there is a paucity of research examining the cognitive, affective, and behavioral expression of affective temperaments in daily life.

### 1.1. Experience sampling methodology

In order to better understand the impact and expression of psychological phenomena in daily life, researchers have employed experience sampling methodology (ESM) (e.g., Myin-Germeys et al., 2003a). ESM is a widely used, within-day self-assessment technique in which participants are prompted at random intervals to complete brief questionnaires. ESM has been increasingly used in clinical and social psychology research and offers several powerful advantages to traditional data collection procedures (e.g., [Csikszentmihalyi and Larson, 1987], [deVries, 1992] and [Reis and Gable, 2000]). Specifically, ESM: (1) repeatedly assesses participants in their normal daily environment, thereby enhancing ecological validity; (2) assesses the participants' experiences at the time of the signal (or in the moment), thereby minimizing retrospective bias; (3) allows for an examination of the context of participants' experiences; and (4) allows for the use of sophisticated multilevel modeling.

### 1.2. Expression of bipolar psychopathology in daily life

Although no research has examined the expression of affective temperaments in daily life, a few studies have assessed bipolar psychopathology in daily life using ESM. Recently, Kwapil et al. (2011) examined the expression of bipolar spectrum psychopathology (as measured by the Hypomanic Personality Scale; Eckblad and Chapman, 1986) in daily life using ESM in a sample of nonclinically ascertained young adults. They found that high scores on the scale were associated with elevated euphoria, energy, dysphoria, irritability, racing thoughts, overconfidence/grandiosity, and risky behavior in daily life. Walsh et al. (2012b) confirmed these findings in an independent sample of young adults. Havermans et al. (2010) examined reactivity to daily hassles and uplifts in a sample of outpatients with remitted bipolar disorder and a control group. They found that bipolar patients had elevated levels of negative affect, and lower positive affect, in comparison to control participants, and found no overall differences in reactivity of negative affect and positive affect to hassles and uplifts. However, the authors reported that bipolar patients with subsyndromal depressive symptoms were more reactive to daily hassles, and perceived them as more stressful, than controls. These findings are consistent with an earlier ESM study in remitted bipolar patients (Havermans et al., 2007) that found that the stressfulness of negative events was positively related to both depression scores and the number of previous episodes of depression. Specifically, individuals who had more than four past episodes of depression experienced negative events as more stressful. Myin-Germeys et al. (2003b) assessed emotional reactivity to daily stress in a group of individuals with non-affective psychosis, bipolar disorder, and major depressive disorder. Results of the study indicated that individuals with major depression and non-affective psychosis experienced increased negative affect in response to stress. Furthermore, individuals with bipolar disorder and non-affective

psychosis experienced a decrease in positive affect in relation to stressful situations. Taken together, this research suggests that ESM offers a useful approach for examining experiences in daily life in patients with mood psychopathology and psychosis. The present research extends this approach in a new direction to assess the relation of affective temperaments with daily life experiences.

### 1.3. Goals and hypotheses

The goal of the present study was to examine the expression of affective temperaments in daily life in a large sample of nonclinically ascertained young adults that includes participants psychometrically identified as at-risk for bipolar spectrum psychopathology. Specifically, the study examined the association of affective temperaments with measures of affect, cognition, behavior, sense of self, and social interactions. It was hypothesized that hyperthymic temperament would be associated with positive affect, fullness of thought, participating in multiple, exciting activities, and confidence/grandiosity in the moment. In contrast, it was hypothesized that cyclothymic/irritable temperament would be associated with negative affect, cognitive difficulties, and engaging in risky behavior. Finally, it was hypothesized that dysthymic temperament would be associated with decreased positive affect, increased negative affect (specifically sadness and worry), cognitive impairment, and decreased confidence/grandiosity.

In addition to the direct effects of affective temperament scores on experiences in daily life, it was expected that affective temperaments would moderate the effects of context in daily life on behaviors. Specifically, it was hypothesized that participants high in cyclothymic/irritable temperament would be especially reactive to stress in the moment in terms of the experience of negative affect and engagement in risky behavior. It was also hypothesized that participants high in hyperthymic temperament would be especially reactive to positive situations in terms of confidence and positive affect.

## 2. Methods

### 2.1. Participants

Approximately 1200 students enrolled in General Psychology courses at the University of North Carolina at Greensboro (UNCG) completed self-report questionnaires as part of a departmental mass screening for course credit. A total of 191 students were invited to participate in a study of risk for bipolar spectrum psychopathology (Walsh et al., 2012b). Specifically, all of the mass-screening participants who scored at least 1.5 SD above the mean on the Hypomanic Personality

Scale (Eckblad and Chapman, 1986) and a comparable number of randomly selected participants who scored less than 1.5 SD above the mean were invited to participate. This recruitment strategy was employed to ensure the inclusion of a sufficient number of individuals who experience bipolar spectrum psychopathology, and presumably a broad range of affective temperaments. A total of 147 participants took part in the study. Two participants were dropped due to invalid questionnaire measures. Seven additional participants were dropped due to failure to complete sufficient ESM protocols (final  $n=138$ ). Participants received research credit for taking part in the study, and those who completed 70% of the ESM questionnaires were entered into a drawing for two \$100 gift cards awarded each semester. The final sample included 95 women and 43 men, with mean age of 19.5 years ( $SD=2.4$  years). Note that all participants provided informed consent. The study was approved by the UNCG Institutional Review Board and conformed to the Helsinki Declaration as revised in 1989.

## 2.2. Materials and procedures

### 2.2.1. Mass screening questionnaires

Mass screening participants completed a brief demographic questionnaire, the Hypomanic Personality Scale, and additional questionnaires not used in the present study. The Hypomanic Personality Scale consists of 48 true–false items that assess mild, trait-like, manic functioning that identify risk for bipolar disorder. The items were intermixed with a 13-item infrequency scale (Chapman and Chapman, 1983). Participants who endorsed more than two infrequency items were dropped from further study.

### 2.2.2. Self-report questionnaires and experience sampling methodology

Participants completed the 50-item short version of the Temperament Evaluation of Memphis, Pisa, Paris, and San Diego-Autoquestionnaire (TEMPS-A; Akiskal et al., 2005) to assess affective temperaments. Akiskal et al. (2005) examined the psychometric properties of the TEMPS-A in a patient population and reported Cronbach alpha coefficients ranging from 0.76 to 0.88 and 6 to 12 month test–retest reliability ranging from 0.58 to 0.70 for the four temperament subscales. Furthermore, the TEMPS-A has good long-term stability over a 6-year timeframe (Kawamura et al., 2010).

The ESM protocol was designed to assess experiences relevant to affective temperaments (e.g., affect, cognitions, etc.) and contextual factors (stressful situations). Table 1 lists the ESM items and indices. Participants received a personal digital assistant (PDA) and were instructed about ESM procedures. The participants kept the PDAs for seven days. The PDAs signaled the

participants, administered the questionnaires, and time-stamped and recorded responses. Participants were signaled to complete ESM questionnaires eight times daily between noon and midnight, and had 3 min to initiate responses following the signal. After this time interval (or completion of the questionnaire), the PDA turned off and did not reactivate until the next signal, ensuring that participants did not skip questionnaires and complete them later.

Table 1. Experience sampling questionnaire.

- 1) I feel confident right now.
- 2) I am doing something exciting right now
- 3) My thoughts are racing right now.
- 4) I have trouble concentrating right now.
- 5) I am thinking about a lot of things right now.
- 6) I am daydreaming right now.
- 7) I feel happy right now.
- 8) I feel bored right now.
- 9) I feel irritable right now.
- 10) I am doing something risky right now.
- 11) I feel sad right now.
- 12) I feel uncertain right now.
- 13) I feel enthusiastic right now.
- 14) I am the center of attention right now.
- 15) I feel worried right now.
- 16) I feel restless right now.
- 17) I am doing something right now that I may regret later.
- 18) I feel optimistic right now.
- 19) I feel angry right now.
- 20) I feel energetic right now.

21) I feel like I am better than most people right now.

22) Are you alone at this time? Yes no

[If with others, no to #22):]

23) I like this person (these people)

24) I feel close to this person (these people)

[If alone, yes to #22:]

25) I am alone right now because people do not want to be with me

26) Right now I would prefer to be with other people

[All participants answer:]

27) I am successful in my current activity.

28) I am doing many things right now.

29) My behavior right now could get me into trouble.

30) My current situation is stressful.

31) My current situation is positive.

#### Indices

1) Exuberance=mean of items 13 and 20

2) Fullness of thought=mean of items 3 & 5

3) Risky behavior=mean of items 10, 17, and 29

Note: Protocol is presented on a personal digital assistant (PDA). Each question appears on a separate screen on the PDA. Participants only see the nonbolded information and scoring options. Unless otherwise noted, all items are scored from 1 (not at all) to 7 (very much).

#### 2.2.3. Statistical method

The analyses examined the association of affective temperaments, as assessed by the TEMPS-A, with ESM responses in daily life. ESM data have a hierarchical structure in which ESM ratings (level 1) are nested within participants (level 2). Multilevel linear modeling provides a more appropriate method than conventional unilevel analyses for nested data ( [Hox, 2002] and [Luke,



2004]). The multilevel analyses examined two types of relations between the TEMPS-A scores and experiences in daily life. The first was the intercept of the level 1 criterion, which assessed the independent effects of the level 2 predictors (TEMPS-A score) on level 1 dependent measures (ESM ratings in daily life).

The second set of analyses examined cross-level interactions of the relation of a level 1 predictor and criterion (e.g., stress and irritability) with the level 2 TEMPS-A scores. Cross-level interactions (Kreft and de Leeuw, 1998) tested whether level 1 relations varied as a function of TEMPS-A scores. If the TEMPS-A predictor was significant, then it explained variability in the within-person slopes.

The analyses were computed with MPlus6.1 (Muthén and Muthén, 2010). Level 1 predictors were group mean centered and level 2 predictors were grand mean centered. The data departed from normality in some cases, so parameter estimates were calculated using robust standard errors. Furthermore, level 1 criteria exhibiting significant skew were treated as categorical.

### 3. Results

#### 3.1. TEMPS-A data

Table 2 presents descriptive data and intercorrelations of the TEMPS-A subscales. Consistent with their conceptual overlap, the cyclothymic and irritable temperaments correlated highly. Therefore, following Walsh et al. (2012a), a combined cyclothymic/irritable variable was created for each participant by computing the mean of the standardized scores for these measures (note that the coefficient alpha of the combined cyclothymic and irritable temperament items were .88). This combined variable was used in place of the individual cyclothymic and irritable variables for all multilevel regression analyses to avoid multicollinearity effects.

Table 2. TEMPS-A descriptive statistics and intercorrelations ( $n=138$ ).

	Mean	SD	Coefficient alpha	Range	Pearson correlations <sup>a</sup>		
					Hyperthymic	Dysthymic	Cyclothymic
Hyperthymic	8.54	2.8	.73	1–13	~		

	Mean	SD	Coefficient alpha	Range	Pearson correlations <sup>a</sup>		
					Hyperthymic	Dysthymic	Cyclothymic
c		5					
Dysthymic	4.66	2.08	.62	1–9	<b>-.43</b> <sup>□□□</sup>	~	
Cyclothymic	4.62	3.99	.85	0–17	-.11	<b>.36</b> <sup>□□□</sup>	~
Irritable	1.57	1.94	.74	0–10	-.15 <sup>□</sup>	.23 <sup>□□□</sup>	<b>.65</b> <sup>□□□</sup>

□  $p < .05$ .

□□□  $p < .001$ .

a medium effect sizes in bold, large effect sizes in bold and italics (Cohen, 1992).

### 3.2. Expression of affective temperaments in daily life

Participants averaged completing 40.4 usable questionnaires (SD=9.9). The number of completed ESM questionnaires was modestly inversely correlated with hyperthymic temperament,  $r = -.17$ ,  $p < .05$ , but not significantly correlated with dysthymic,  $r = .13$ , cyclothymic,  $r = -.09$ , or irritable,  $r = -.05$ , temperaments.

Table 3 presents the direct effects of affective temperaments with affect, thoughts, and behaviors in daily life. As hypothesized, hyperthymic temperament was associated with positive, but not negative, affect, and the evaluation that the current situation is positive. It was also associated with reports of doing many things and exciting activities. Finally, hyperthymic temperament was associated with racing thoughts and reports of many thoughts, difficulty concentrating and restlessness. In contrast, cyclothymic/irritable temperament was associated with a broad range of increased negative affect, and decreased positive affect. It was associated with evaluation that the immediate situation was stressful and engaging in risky behavior. Unlike hyperthymic temperament, it was not associated with racing thoughts, but was associated with concentration

difficulties. Surprisingly, dysthymic temperament was generally unrelated to reports of positive or negative affect, or perceptions about the current situation. It was, however, associated with cognitive difficulties.

Table 3. Relation of affective temperaments with affect, thoughts, and behavior in daily life ( $n=138$ ).

ESM criterion	Level 2 predictors ( $df=133$ )		
	Hyperthymic temperament	Dysthymic temperament	Cyclothymic/Irritable temperament
Affect			
Happy	0.170 ( $SE=0.085$ ) <sup>□</sup>	0.010 ( $SE=0.085$ )	-0.230 ( $SE=0.065$ ) <sup>□□□</sup>
Exuberant	0.344 ( $SE=0.085$ ) <sup>□□□</sup>	0.079 ( $SE=0.083$ )	-0.206 ( $SE=0.092$ ) <sup>□</sup>
Angry	0.058 ( $SE=0.054$ )	-0.038 ( $SE=0.066$ )	0.311 ( $SE=0.068$ ) <sup>□□□</sup>
Sad	0.113 ( $SE=0.073$ )	0.045 ( $SE=0.078$ )	0.348 ( $SE=0.073$ ) <sup>□□□</sup>
Irritable	0.076 ( $SE=0.077$ )	0.018 ( $SE=0.084$ )	0.400 ( $SE=0.088$ ) <sup>□□□</sup>
Worried	0.127 ( $SE=0.086$ )	0.198 ( $SE=0.088$ ) <sup>□</sup>	0.325 ( $SE=0.088$ ) <sup>□□□</sup>
Current situation is positive	0.209 ( $SE=0.082$ ) <sup>□□</sup>	0.083 ( $SE=0.080$ )	-0.226 ( $SE=0.066$ ) <sup>□□□</sup>
Current situation is stressful	0.152 ( $SE=0.089$ )	0.147 ( $SE=0.089$ )	0.390 ( $SE=0.084$ ) <sup>□□□</sup>
Thoughts			

ESM criterion	Level 2 predictors ( <i>df</i> =133)		
Trouble concentrating	0.188 ( <i>SE</i> =0.082) <sup>□</sup>	0.259 ( <i>SE</i> =0.083) <sup>□□</sup>	0.259 ( <i>SE</i> =0.102) <sup>□</sup>
Fullness of thought	0.262 ( <i>SE</i> =0.102) <sup>□□</sup>	0.274 ( <i>SE</i> =0.092) <sup>□□</sup>	0.204 ( <i>SE</i> =0.118)
Daydreaming	0.140 ( <i>SE</i> =0.105)	-0.010 ( <i>SE</i> =0.096)	0.258 ( <i>SE</i> =0.110) <sup>□</sup>
Behaviors			
Risky behavior	0.081 ( <i>SE</i> =0.046)	-0.010 ( <i>SE</i> =0.053)	0.167 ( <i>SE</i> =0.054) <sup>□□</sup>
Restlessness	0.234 ( <i>SE</i> =0.096) <sup>□</sup>	0.211 ( <i>SE</i> =0.086) <sup>□</sup>	0.319 ( <i>SE</i> =0.103) <sup>□□</sup>
Doing something exciting	0.278 ( <i>SE</i> =0.069) <sup>□□□</sup>	0.066 ( <i>SE</i> =0.068)	-0.075 ( <i>SE</i> =0.072)
Doing many things	0.338 ( <i>SE</i> =0.079) <sup>□□□</sup>	0.098 ( <i>SE</i> =0.074)	0.050 ( <i>SE</i> =0.096)

*Note.* Values are raw multilevel regression coefficients (and standard error).

□  $p < .05$ .

□□  $p < .01$ .

□□□  $p < .001$ .

Table 4 presents the direct effects of affective temperaments with measures of sense of self in the world and social functioning. As hypothesized, hyperthymic temperament was associated with grandiosity and with a desire to be with others when alone. Cyclothymic/irritable temperament was associated with negativity and pessimism, boredom, and reduced desire for social contact. Dysthymic temperament was associated with uncertainty, feeling socially rejected, and desiring social contact.

Table 4. Relation of affective temperaments with sense of self and social interactions in daily life ( $n=138$ ).

ESM Level 1 Criterion	Level 2 Predictors ( $df=133$ )		
	Hyperthymic Temperament	Dysthymic Temperament	Cyclothymic/Irritable Temperament
Sense of self in the world			
Confident	0.352 ( $SE=0.146$ ) <sup>□</sup>	-0.077 ( $SE=0.136$ )	-0.067 ( $SE=0.112$ )
Center of attention	0.264 ( $SE=0.100$ ) <sup>□□</sup>	-0.006 ( $SE=0.087$ )	0.050 ( $SE=0.077$ )
Optimistic	0.304 ( $SE=0.096$ ) <sup>□□</sup>	0.137 ( $SE=0.097$ )	-0.167 ( $SE=0.096$ ) <sup>□</sup>
Better than others	0.513 ( $SE=0.126$ ) <sup>□□□</sup>	0.035 ( $SE=0.116$ )	0.163 ( $SE=0.115$ )
Successful in current activity	0.122 ( $SE=0.085$ )	0.004 ( $SE=0.084$ )	-0.189 ( $SE=0.075$ ) <sup>□</sup>
Uncertain	0.139 ( $SE=0.091$ )	0.190 ( $SE=0.096$ ) <sup>□</sup>	0.383 ( $SE=0.093$ ) <sup>□□□</sup>
Bored	0.026 ( $SE=0.064$ )	0.025 ( $SE=0.077$ )	0.234 ( $SE=0.068$ ) <sup>□□</sup>
Social Interactions			
Alone <sup>a</sup> at signal	0.116 ( $SE=0.065$ )	0.034 ( $SE=0.076$ )	-0.094 ( $SE=0.071$ )
When alone:			
Prefer to be with others	0.409 ( $SE=0.138$ ) <sup>□□</sup>	0.424 ( $SE=0.144$ ) <sup>□□</sup>	-0.315 ( $SE=0.119$ ) <sup>□□</sup>

ESM Level 1 Criterion	Level 2 Predictors ( <i>df</i> =133)		
Alone b/c not wanted	0.070 ( <i>SE</i> =0.042)	0.100 ( <i>SE</i> =0.048) <sup>□</sup>	0.074 ( <i>SE</i> =0.058)
When with others:			
Close to other(s)	0.124 ( <i>SE</i> =0.089)	0.044 ( <i>SE</i> =0.092)	-0.035 ( <i>SE</i> =0.089)
Like other(s)	0.069 ( <i>SE</i> =0.067)	0.079 ( <i>SE</i> =0.073)	-0.094 ( <i>SE</i> =0.071)

*Note.* Values are raw multilevel regression coefficients (and standard error).

□  $p < .05$ .

□□  $p < .01$ .

□□□  $p < .001$ .

a Item is reverse scored (1=yes [alone], 2=no [with others]).

### 3.3. Moderating effects of affective temperaments on experiences in daily life

Cross-level interactions examined whether affective temperaments moderated the association of stress in the moment with negative affect and risky behavior (Table 5). Viewing one's situation as stressful was associated with increased ratings of irritability, anger, and sadness, and as hypothesized this effect was more pronounced in participants with elevated cyclothymic/irritable temperament (as illustrated in Fig. 1). Cross-level interactions also examined whether temperaments moderated the association of viewing one's situation as positive with affect and confidence. Not surprisingly, rating one's situation as positive was significantly associated with confidence, exuberance, and optimism in the moment, independent of temperament. Contrary to our hypotheses, hyperthymic temperament did not moderate these relations. However, dysthymic temperament did moderate the associations with confidence and exuberance. As seen in Fig. 2, participants high in dysthymic temperament reported comparable levels of confidence compared to their low dysthymic peers when their situation was positive. However, the confidence of high dysthymic participants was more adversely impacted by feeling that the situation was not positive than was the confidence of low dysthymic participants.

Table 5. Cross-level interactions of affective temperament and experiences in daily life.

ESM level 1 criterion	ESM level 1 predictor	Relation of ESM predictor & criterion	Level 2 Predictors ( <i>df</i> =134)		
			Hyperthymic temperament	Dysthymic temperament	Cyclothymic/irritable temperament
Irritable	Situation Stressful	0.316 ( <i>SE</i> =0.019) <sup>□□□</sup>	0.002 ( <i>SE</i> =0.022)	0.000 ( <i>SE</i> =0.020)	0.046 ( <i>SE</i> =0.017) <sup>□□</sup>
Sad	Situation Stressful	0.208 ( <i>SE</i> =0.017) <sup>□□□</sup>	0.021 ( <i>SE</i> =0.016)	0.001 ( <i>SE</i> =0.017)	0.046 ( <i>SE</i> =0.014) <sup>□□</sup>
Angry	Situation Stressful	0.242 ( <i>SE</i> =0.017) <sup>□□□</sup>	0.001 ( <i>SE</i> =0.018)	-0.004 ( <i>SE</i> =0.018)	0.064 ( <i>SE</i> =0.016) <sup>□□□</sup>
Risky behavior	Situation Stressful	0.104 ( <i>SE</i> =0.015) <sup>□□□</sup>	-0.002 ( <i>SE</i> =0.018)	0.004 ( <i>SE</i> =0.017)	-0.005 ( <i>SE</i> =0.015)
Confident	Situation Positive	0.283 ( <i>SE</i> =0.019) <sup>□□□</sup>	0.011 ( <i>SE</i> =0.020)	0.041 ( <i>SE</i> =0.020) <sup>□</sup>	-0.007 ( <i>SE</i> =0.018)
Exuberant	Situation Positive	0.319 ( <i>SE</i> =0.018) <sup>□□□</sup>	0.011 ( <i>SE</i> =0.019)	0.069 ( <i>SE</i> =0.020) <sup>□□</sup>	-0.005 ( <i>SE</i> =0.017)
Optimistic	Situation Positive	0.329 ( <i>SE</i> =0.021) <sup>□□□</sup>	0.010 ( <i>SE</i> =0.023)	0.045 ( <i>SE</i> =0.025)	0.026 ( <i>SE</i> =0.021)

*Note.* Values are raw multilevel regression coefficients (and standard error).

□ *p*<.05.

□□ *p*<.01.

□□□ *p*<.001.

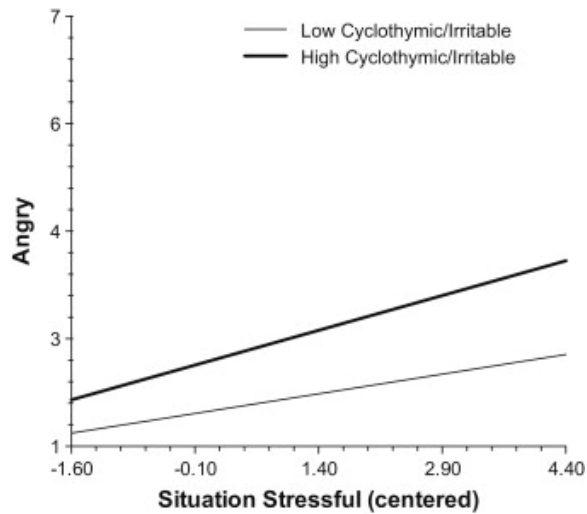


Fig. 1. Cyclothymic/irritable temperament moderates the association of stress and anger in daily life.

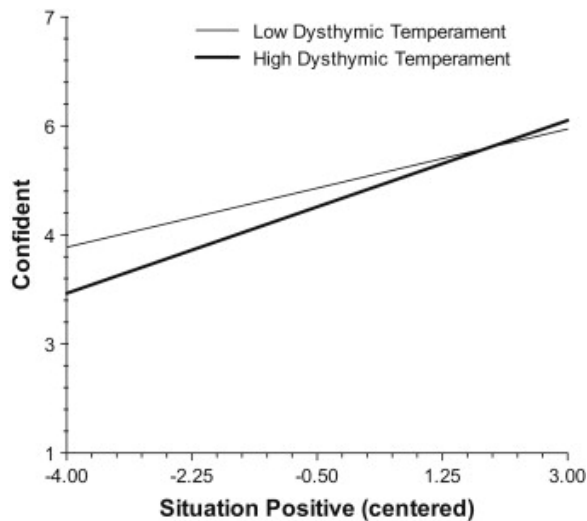


Fig. 2. Dysthymic temperament moderates the association of situation positive and confidence in daily life.

#### 4. Discussion

Although affective temperaments have been previously examined in both clinical (e.g., Di Florio et al., 2010) and nonclinical (e.g., Walsh et al., 2012a) samples, these studies primarily relied on cross-sectional assessments in laboratory or clinical settings. To our knowledge, the present study is the first to examine the expression of affective temperaments in daily life using ESM. Thus, the current research builds upon previous validation studies of affective temperaments, and offers a novel approach to their assessment.



As expected, cyclothymic/irritable temperament was associated with a variety of negative outcomes in daily life. Specifically, cyclothymic/irritable temperament was associated with a range of negative affect in daily life, including anger, irritability, sadness, and worry, underscoring the association between cyclothymic/irritable temperament and mood dysregulation. Furthermore, cyclothymic/irritable temperament was associated with perceiving daily life as stressful. Individuals with elevated cyclothymic/irritable temperament may be more likely to perceive situations as stressful and to experience heightened levels of negative affect in response to their stressful environment. Cyclothymic/irritable temperament was also associated with risky behavior and restlessness. This finding likely reflects the relationship between cyclothymic/irritable temperament and negative urgency, a tendency to engage in risky behavior in the face of negative affect. Cyclothymic/irritable temperament's association with impulsive behavior in daily life is also consistent with its relation with borderline psychopathology (Walsh et al., 2012a). Additionally, cyclothymic/irritable temperament was associated with a negative sense of self in daily life. Specifically, the temperament was positively associated with feeling uncertain and bored, and was negatively associated with feeling successful. Overall, these findings suggest that cyclothymic/irritable temperament is associated with negative affect, negative self-perceptions, as well as negative perceptions of external events. These experiences likely influence and exacerbate one another. For example, feeling unsuccessful in one's current activity may result in feelings of sadness and worry, and perceptions of one's current activity as stressful.

Consistent with our hypotheses, cyclothymic/irritable temperament moderated the association of stress in the moment with negative affect and risky behavior. Viewing one's situation as stressful was associated with increased ratings of irritability, anger, and sadness, and this effect was heightened in participants with elevated cyclothymic/irritable temperament. Note that these findings mirror Maremmani et al. (2011) findings in which cyclothymic temperament was associated with agitation following a stressful event. Additionally, the relation of stressful situations and risky behavior was enhanced in individuals with elevated cyclothymic/irritable temperament—underscoring the relation of this temperament with negative urgency. Generally, individuals high on cyclothymic/irritable temperament experience more negative affect in daily life in comparison to their hyperthymic and dysthymic peers—and experience even greater negative affect in stressful situations. Furthermore, stress was associated with increased likelihood of engaging in risky behavior in daily life. Although there was not a cross-level interaction with cyclothymic/irritable temperament, high cyclothymic/irritable participants were more likely to experience their situation as stressful and hence more likely to engage in risky activities.

In comparison to cyclothymic/irritable temperament, hyperthymic temperament was associated with more adaptive outcomes in daily life. Consistent with Akiskal's (2004) definition, hyperthymic temperament was associated with exuberance and happiness, as well as optimism, engagement in exciting activities, and a desire to be with others. However, hyperthymic temperament was also associated with grandiosity in daily life, including feeling better than others and feeling like the center of attention. Thus, the hyperthymic temperament is characterized by an upbeat attitude and high energy, as well as inflated perceptions of self-supporting the over-confident, boastful quality of the temperament (Akiskal, 2004).

In several cases, hyperthymic and cyclothymic/irritable temperament were associated with the same experiences in daily life, but in the opposite direction. For example, hyperthymic temperament was positively associated with happiness, exuberance, and perceiving daily life as positive, whereas cyclothymic/irritable temperament was negatively associated with these measures of positive affect. Similarly, hyperthymic temperament and cyclothymic/irritable temperament displayed opposite associations with optimism, offering support for the notion of the hyperthymic temperament as carefree and optimistic and the cyclothymic/irritable temperament as more pessimistic. Hyperthymic temperament was positively associated with a preference to be with others—consistent with the temperament's characterization as gregarious and jocular (Akiskal and Mallya, 1987). Individuals with elevated cyclothymic/irritable temperament, however, exhibited a desire to be alone, which may be driven by their heightened negative affect, and tendency to perceive situations as stressful. Taken together, these results offer further validation for distinct affective temperament profiles.

Dysthymic temperament has been characterized by habitual gloominess, brooding, feelings of guilt, self-denigration, anhedonia, and lethargy ([Akiskal and Mallya, 1987] and [Akiskal, 1996]). Additional characteristics of this temperament include being shy, non-assertive, sensitive to criticism, self-denying, dependable, conscientious, skeptical, pessimistic, humorless, and incapable of fun ([Akiskal, 1983] and [Akiskal, 1989]). The present study found that dysthymic temperament was modestly associated with worry and uncertainty, offering some support for the association of the temperament with rumination. Additionally, dysthymic temperament was associated with cognitive difficulties in daily life, specifically trouble concentrating and fullness of thought, although it is unclear whether these cognitive difficulties are related to time spent worrying and brooding. Dysthymic temperament was associated with a preference for the company of others, but also feeling unwanted by others when alone. Thus, it seems reasonable to characterize dysthymic temperament as sensitive and self-critical. Surprisingly, the present research did not offer support for the gloomy, pessimistic, lethargic qualities of dysthymic temperament. Specifically, dysthymic temperament was unrelated to measures of sadness, and it did not evidence expected inverse associations with positive affect, energy, or the positive self-

perceptions of confidence and optimism. Cross-level interactions suggested that individuals high on dysthymic temperament were especially reactive to positive situations. Specifically, individuals with elevated dysthymic temperament experienced increased confidence and exuberance when they perceived their current situation as positive. These findings are in contrast to the characterization of dysthymic individuals as consistently down-trodden. Future studies need to examine the construct validity of dysthymic temperament. Based on the present findings, it is unclear if the temperament is best characterized by a habitually melancholic mood, or by the less extreme qualities of low self-esteem and a tendency to worry.

The present study was the first investigation of affective temperaments in daily life. Future studies should build on this work by examining the expression of affective temperaments in clinical samples. Furthermore, ESM data collection was limited to one week. Longer assessment periods might better capture the cyclical nature of affective temperaments. For example, Trull et al. (2008) conducted ESM research for one month to examine affective instability in patients with borderline personality disorder and depressive disorders.

The present research offers further support for the validation of affective temperaments. The TEMPS-A is a short and useful tool for measuring affective temperaments, and can aid in the detection of bipolar spectrum disorders (Walsh et al., 2012a). The present study offers support for unique temperament profiles for cyclothymic/irritable, hyperthymic, and dysthymic temperaments. Cyclothymic/irritable temperament appears to have the most maladaptive consequences in daily life, ranging from negative affect and stress reactivity to engagement in risky behaviors. Hyperthymic temperament, although associated primarily with adaptive qualities such as exuberance and optimism, is also associated with grandiose perceptions of self. In our study, dysthymic temperament was modestly associated with worry and uncertainty, but not sadness or diminished positive affect. Additional studies are needed to better understand the nature of this temperament.

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#### Conflict of interest

None of the authors had any conflicts of interest.

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