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# Parsing Affective Dynamics to Identify Risk for Mood and Anxiety Disorders

AQ: 1

AQ: au

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Emotional dysregulation is thought to underlie risk for both anxiety and depressive disorders. However, despite high rates of comorbidity, anxiety and depression are phenotypically different. Apart from nosological differences (e.g., worry for anxiety, low mood for depression), it remains unclear how the emotional dysregulation inherent in individual differences in trait anxiety and depression severity present on a day-to-day basis. One approach that may facilitate addressing these questions is to utilize Ecological Momentary Assessment (EMA) using mobile phones to parse the temporal dynamics of affective experiences into specific parameters. An emerging literature in affective science suggests that risk for anxiety and depressive disorders may be associated with variation in the mean and instability/variability of emotion. Here we examine the extent to which distinct temporal dynamic parameters uniquely predict risk for anxiety versus depression. Over 10 days, 105 individuals rated their current positive and negative affective state several times each day. Using two distinct approaches to statistically assess mean and instability of positive and negative affect, we found that individual differences in trait anxiety was generally associated with increased instability of positive and negative affect whereas mean levels of positive and negative affect were generally associated with individual differences in depression. These data provide evidence that the emotional dysregulation underlying risk for mood versus anxiety disorders unfolds in distinct ways and highlights the utility in examining affective dynamics to understand psychopathology.

*Keywords:* affective dynamics, emotion dynamics, mood disorders, anxiety, mood instability

Although diagnostically separated, anxiety and depression are often comorbid (Kessler et al., 2003). Nonetheless, despite substantial overlap in symptomatology, depression and anxiety remain diagnostically distinct, in part because the day-to-day emotional experiences and self-reports of individuals with anxiety or depression can differ. It has been suggested that heightened anxiety is uniquely associated with heightened physiological arousal, heightened depression is uniquely associated with lower levels of positive affect, and negative affect is a feature common to both anxiety and depression (Watson et al., 1995). Other research suggests that anxiety concerns worry and apprehension about what is to come, whereas depression is focused on failures and mistakes in the past (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Yet much of the research addressing the affective features that characterize and distinguish between individual differences in depression and anxiety has typically utilized cross-sectional and retrospective self-reports. In the moment self-reports of what individuals are currently experiencing often differ from individual's recollection for what occurred in the past (Redelmeier, Katz, & Kahneman, 2003). This has led some to suggest that ratings of current affect may be a better way to assess individual differences (Kahneman & Krueger, 2006). Acquiring these data has become substantially easier with the advent of cell phone based Ecological Momentary Assessment (EMA).

An additional benefit of in the moment ratings using EMA is the ability to gather intensive longitudinal data (Kaplan & Stone, 2013). And importantly, intensive longitudinal data permits testing questions of whether the temporal dynamics of AQ: 5 emotional experiences uniquely capture information regarding individual differences in depression or anxiety. Theoretical and empirical data have been emerging to suggest that specific temporal dynamics of positive and negative emotion may

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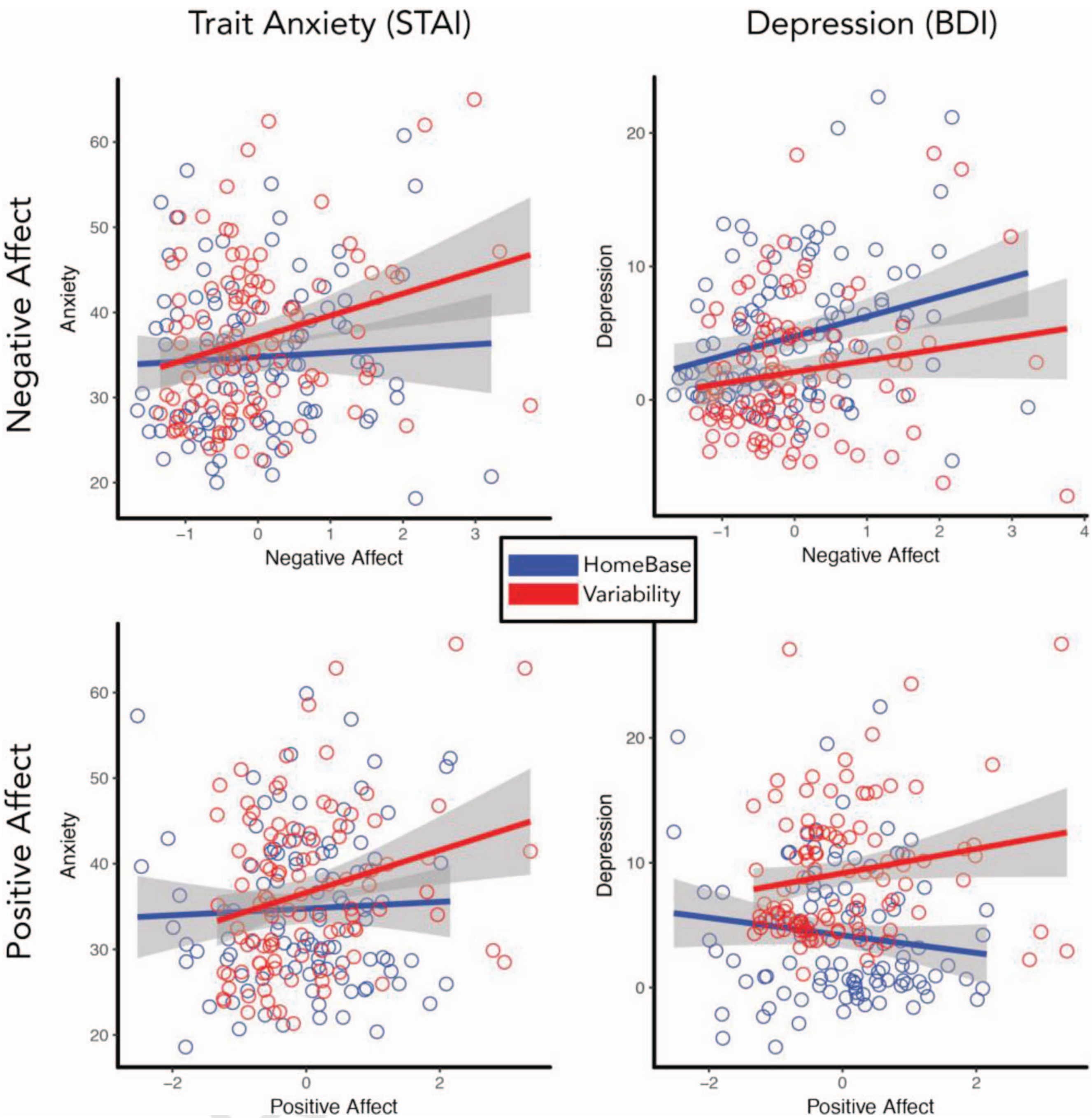


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*Figure 1.* Partial correlation plots illustrating associations between EMA positive and negative affect and trait anxiety (STAI) and depression using the DynAffect Approach. For example, these plots demonstrate the association between negative affect homebase and trait anxiety controlling for instability (and vice versa). X-Axis is z-scored so both positive and negative affect are on the same scale.

uniquely account for individual differences associated with trait anxiety and depression (Trull, Lane, Koval, & Ebner-Priemer, 2015). For example, there is evidence that individuals entering a depressive episode display greater mean and inertia (less change/slowing down) of negative affect (Kuppens, Oravecz, & Tuerlinckx, 2010; van de Leemput et al., 2014). In contrast, there is some evidence that anxiety is associated with heightened affective instability (Pfaltz, Michael, Grossman, Margraf, & Wilhelm, 2010). Therefore, a compelling question is the degree to which individual differences in anxiety and depression can be accounted for by unique temporal dynamics of positive and negative affect.

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As such, using EMA, we examined whether there might be unique temporal dynamic parameters of positive and negative affect that are predicative of individual differences in trait anxiety and depression. To that end, we collected EMA data from 105 participants several times per day for 10 days who reported their current levels of positive and negative affect. In addition, participants completed traditional self-reported assessments of trait anxiety and depression. To analyze these temporal dynamics, we utilize a theoretical and statistical approach, the DynAffect model, (Kuppens et al., 2010), to examine whether specific temporal dynamic parameters of emotional regulation are specifically associated with risk for anxiety or depression. The DynAffect model proposes that individual differences in affect patterns can be accounted for in terms of three fundamental affective processes: the affective homebase, affective variability, and attractor strength. An additional advantage of utilizing this framework is that it operationalizes emotional dynamics into specific parameters that can specifically be tested (e.g., Carpenter & Trull, 2013). We followed up these initial results and performed nonindependent and conceptually related follow-up analyses using the arithmetic mean (akin to the "homebase" parameter), as well a distinct measure of variability, the mean square of successive differences (MSSD; which is often referred to as instability and is similar to the affective variability parameter referred to above), to assess the consistency of these results with the DynAffect approach. We thus apply this framework to this dataset to examine whether specific dynamics of positive or negative affect are associated with individual differences in levels of depression or anxiety in a nonclinical sample. Given previous work, we predict that mean positive affect will be negatively associated with depression severity, while mean negative affect will be associated with increased depression and anxiety. And because anhedonia has been theorized to be specifically associated with depression and not anxiety (Watson et al., 1995), we ran additional tests utilizing specific measures of anhedonia to examine the specificity of any effects. Given previous work examining emotional instability/variability (e.g., Houben, Van Den Noortgate, & Kuppens, 2015), we anticipated that variability of both positive and negative emotion would be associated with higher levels of anxiety and depression. We did not have specific hypotheses regarding the specificity of the effects.

# Method

## Participants

105 human participants were recruited from the community (Mean age: 20.48, *SD* = 2.76, 43 male, 18–36 years) and participated in a 10-day study examining real-world affective functioning. There were no specific inclusion or exclusion criteria. Participants provided informed consent approved by the University of Wisconsin—Madison IRB.

## Self-Report Measures of Depression and Anxiety

**Depression severity.** Depression severity was measured using the Beck Depression Inventory-II (BDI; Beck & Steer, 1987). The BDI is a 21-item self-report scale of depression asking participants to report the severity of their current depressive symptoms. Internal consistency for the BDI ranges from .73 to .92 with a mean of .86. (Beck, Steer, & Carbin, 1988). Mean BDI was 6.10 (*SD* = 5.41, Min = 0, Max = 24.5). In general, our sample did not have BDI scores that met clinical thresholds: three participants had scores that correspond to "moderate depression" (>19 on BDI), and seven who have scores in the mild range (>13 & <20). Given previous empirical and theoretical work linking positive affect to depression specifically (while anxiety is thought to be shared across both anxiety and depression; Clark & Watson, 1991; Watson et al., 1995), we also created an anhedonia subscale from the BDI (Pizzagalli, Jahn, & O'Shea, 2005). The anhedonic subscale was calculated by taking the mean responses on BDI items associated with anhedonic symptoms: loss of pleasure (item #4), loss of interest (item #12), and loss of interest in sex (item #21). Mean BDI-Anhedonia was 0.60 (*SD* = 0.85, Min = 0, Max = 4).

**Trait anxiety.** Trait anxiety was measured using the Spielberger Trait Anxiety Inventory (STAI; Spielberger, 1983). The STAI is a 20-item measure of trait anxiety focused on areas including: worry, tension, apprehension, and nervousness. The STAI is not a clinical scale of anxiety but measures trait anxiety levels. Internal consistency coefficients for the scale have ranged from .86 to .95 while test–retest reliability coefficients have ranged from .65 to .75 over a 2-month interval (Spielberger ~~et al.~~, 1983). AQ: 2
Mean STAI was 39.01 (*SD* = 9.36, Min = 24, Max = 67).

## Lab Procedure

Participants provided their cellular telephone number and available 10–12 hr periods for each of the 10 days. BDI and STAI were assessed in the lab before and after the 10 day EMA assessment period. For analyses presented below, we calculated the mean BDI and STAI across the two assessments (acquired before and after the 10-day EMA period).

## EMA Procedure

Subjects were prompted at random intervals over the day to rate current positive and negative emotion ("Please rate your current positive (1-9) and negative emotion (1-9")). Subjects responded with two digits, separated by a space. A "9" rating indicated the participant was feeling a very high amount of that emotion, while a "1" rating indicated the participant was feeling a very low amount of that emotion. Subjects were instructed to take no more than a moment to check-in with themselves and respond with the most appropriate number. SMS messages were sent at 60 to 90 min intervals. The number of prompts per day was identical on each day for every participant. To incentivize compliance, if subjects responded to more than 90% of the text messages within 7 min, they would receive an additional $4 bonus for that day, meaning they could make up to an additional $40.

**EMA data analysis.** Mean EMA response rate was 76.46% (Median = 78.83%, Min = 40.34%, Max = 90.53%, *SD* = 10.74%). To examine whether differences in mean and instability of positive and negative affect were associated with individual differences in depression and anxiety, we calculated the mean and instability in PA and NA across the 10 days. First, we analyzed EMA data using the DynAffect model (Kuppens et al., 2010; Oravecz, Tuerlinckx, & Vandekerckhove, 2009). In the DynAffect model, changes in affect are driven by three parameters, a) the affective homebase (akin to an individual's affective baseline state), b) affective variability (reflecting the changes around the affective homebase), and c) the attractor strength (reflecting processes of regulation pull the individual's current affective state back to its homebase). Parameters reflecting affective homebase, affective variability and attractor strength for positive and negative affect were extracted for each participant using freely available (https://sites.psu.edu/zitaoravecz/) Matlab code (Oravecz et al., 2009). First we report main effects to examine whether self-reported positive or negative affect has a higher estimated homebase, variability or attractor. Second, we performed zero-order correlations (see Table 1) to investigate whether individual DynAffect parameters were associated with trait measures of anxiety and/or depression. And third, multiple regression analyses at the group level were performed to examine which parameters were specifically associated with trait depression or trait anxiety. The three within affect parameters (e.g., negative affect homebase, negative affect variability, negative affect attractor strength) were used as predictors in simultaneous regressions to predict measures of trait anxiety and depression, separately. The same two regression analyses were performed for positive affect. We also included all six regressors (three positive, three negative affect predictors) in a more complete model to separately predict trait anxiety and depression.

Next, we performed complementary analyses by calculating mean instability of positive and negative affect and examining the extent to which results derived from the DynAffect method were reliable across analysis strategies. This will be referred to as the ArithmeticApproach, which is intended to provide nonindependent complementary evidence to support conclusions based on the DynAffect model. Mean was calculated using the arithmetic mean; instability was calculated using the mean of sum of squared differences (MSSD) approach: $\delta^2 = \frac{\sum_{i=1}^{n-1}(x_{i+1} - x_i)^2}{n-1}$ (von Neumann, Kent, Bellinson, & Hart, 1941). We utilized MSSD instead of standard deviation, as standard deviation is not time-sensitive as it discards the moment-by-moment impact central to affective instability (Ebner-Priemer, Eid, Kleindienst, Stabenow, & Trull, 2009), and MSSD is currently utilized more frequently than standard deviation metrics. The metric MSSD is typically referred to as "instability" in the affective science literature and we will use that term here.

Group analyses for the ArithmeticApproach was identical to the approach used in the DynAffect analyses. The first goal was to examine whether the mean and instability of positive and negative affect differed as a function of valence. We performed one-sample paired $t$ tests to assess whether these measures differed as a function of valence. Second, we performed robust regression analyses (which control for the presence of outliers) to test whether these EMA parameters predicted individual differences in depression or anxiety. For all analyses, we report both $p$ values that are corrected for multiple comparisons using the false discovery rate (p.adjust method in R, Version 3.4.0, the "BH" approach).

Although we chose to focus on across-day instability here, we also tested the relationship between across day and within-day MSSD. The correlation between the across-day estimate of instability was strongly positively associated with the average within-day measure of instability (For NA $r$ = .92, for PA $r$ = .90) and all results presented below were similar as when calculating MSSD instability across days. This suggests that the ~~average~~ within-day instability is very similar to the instability ~~across days~~.

## Results

### DynAffect Approach:

**DynAffect approach: positive and negative affect—main effects.** In this sample, positive affect homebase was higher than negative affect homebase (homebase$_{\text{positive affect}}$: 6.02, homebase$_{\text{negative affect}}$: 2.88; $t(104) = 17.43$, $p < .001$). Conversely

Table 1
*Correlation Matrices for Affective Dynamics Using the (A) DynAffect Model, and More Traditional Metrics of Mean and Instability of Positive and Negative Affect*

| | PA HomeBase | NA HomeBase | PA Variability | NA Variability | PA Attractor | NA Attractor | STAI | BDI |
|---|---|---|---|---|---|---|---|---|
| PA HomeBase | 1 | −.27$^{**}$ | −.48$^{***}$ | −.41$^{***}$ | −.01 | .02 | −.08 | −.22$^{*}$ |
| NA HomeBase | **.01** | 1 | .34$^{***}$ | .56$^{***}$ | .14 | −.05 | .2$^{*}$ | .36$^{***}$ |
| PA Variability | **<.001** | **<.001** | 1 | .74$^{***}$ | −.06 | −.01 | .24$^{**}$ | .24$^{**}$ |
| NA Variability | **<.001** | **<.001** | **<.001** | 1 | .2$^{*}$ | −.09 | .3$^{***}$ | .31$^{***}$ |
| PA Attractor | **.95** | **.17** | **.57** | **.04** | 1 | .43$^{***}$ | .02 | .04 |
| NA Attractor | **.85** | **.64** | **.92** | **.35** | **<.001** | 1 | .02 | −.01 |
| STAI | **.39** | **.04** | **.01** | **<.001** | **.87** | **.8** | 1 | .75$^{***}$ |
| BDI | **.03** | **<.001** | **.01** | **<.001** | **.67** | **.94** | **<.001** | 1 |

| | PA Mean | NA Mean | PA MSSD | NA MSSD | STAI | BDI |
|---|---|---|---|---|---|---|
| PA Mean | 1 | −.32$^{***}$ | −.44$^{***}$ | −.39$^{***}$ | −.23$^{*}$ | −.26$^{**}$ |
| NA Mean | **<.001** | 1 | .4$^{***}$ | .53$^{***}$ | .45$^{***}$ | .48$^{***}$ |
| PA MSSD | **<.001** | **<.001** | 1 | .82$^{***}$ | .32$^{***}$ | .24$^{**}$ |
| NA MSSD | **<.001** | **<.001** | **<.001** | 1 | .38$^{***}$ | .35$^{***}$ |
| STAI | .02 | **<.001** | **<.001** | **<.001** | 1 | .75$^{***}$ |
| BDI | .01 | **<.001** | .01 | **<.001** | **<.001** | 1 |

PA = Positive Affect; NA = Negative Affect. Zero-order correlations are given above the diagonal. Uncorrected $p$ Values are shown in bold below the diagonal.
$^{*}$ $p < .05$. $^{**}$ $p < .01$. $^{***}$ $p < .001$.

negative affect variability was higher than positive affect variability (variability$_{\text{positive affect}}$: 1.86, variability$_{\text{negative affect}}$: 2.09; $t(104) = -2.39$, $p = .02$). However, there was no difference in attractor strength for positive versus negative affect (attractor$_{\text{positive affect}}$: 0.021, attractor$_{\text{negative affect}}$: 0.023; $t(104) = -1.57$, $p = .12$).

**DynAffect approach: relationships between individual differences in positive and negative affect.** Table 1 displays the zero-order correlations between the estimates of baseline and instability of positive and negative affect as well as STAI and BDI. EMA measures of mean and instability of positive and negative affect were all associated with both depression and anxiety. Higher homebase positive affect was protective as it was associated with lower levels of depression, but was not associated with anxiety. On the other hand, higher homebase negative affect was a risk factor for higher levels of depression and anxiety. In contrast, higher levels of positive and negative affect variability were both risk-factors for both depression and anxiety: they were independently associated with higher levels of ~~trait~~ depression and anxiety. Lastly, neither the attractor strength of positive or negative affect were associated with ~~trait~~ depression or anxiety.

Next we examined whether specific features of positive and negative emotion were associated with depression and anxiety separately, we performed separate multiple regression analyses to examine whether homebase, variability and attractor of positive affect differentially predicts depression versus anxiety and separately whether homebase, variability and attractor of negative affect differentially predicts depression versus anxiety.

**DynAffect approach: trait anxiety and positive affect.** We first performed a simultaneous multiple regression to test whether positive affect homebase, variability and attractor predicted individual differences in trait anxiety. Positive affect variability was associated with trait anxiety ($B = 2.04$, $t(101) = 2.40$, $p = .02$), such that higher variability of positive affect was associated with higher trait anxiety while controlling for individual differences in positive affect homebase and attractor. In contrast, there was no association between positive affect homebase or attractor and trait anxiety (homebase: $B = 0.32$, $t(101) = 0.38$, $p = .70$; attractor: $B = 21.21$, $t(101) = 0.32$, $p = .75$).

**DynAffect approach: trait anxiety and negative affect.** We then performed a simultaneous multiple regression to test whether negative affect homebase, variability and attractor predicted individual differences in trait anxiety. Negative affect variability was associated with trait anxiety ($B = 1.71$, $t(101) = 2.42$, $p = .02$), such that higher negative affect variability was associated with worse trait anxiety while controlling for individual differences in negative affect homebase and attractor. In contrast, there was no association between negative affect homebase or attractor and trait anxiety (homebase: $B = 0.45$, $t(101) = 0.47$, $p = .64$; attractor: $B = 27.88$, $t(101) = 0.55$, $p = .58$).

**DynAffect approach: trait anxiety and positive and negative affect.** Lastly, we included all six DynAffect parameters (positive/negative affect x homebase/variability/attractor) in the same model to predict trait anxiety. In this model there were no uniquely significant associations. However, associations remained in the same direction despite the effect sizes having attenuated: Of note, variability of negative affect was nonsignificantly associated with trait anxiety ($B = 0.53$, $t(98) = 1.67$, $p = .09$; all other parameters, $p$'s $> 0.40$), despite being in the same direction. This result is likely due to suppression between parameters in the model, and should be interpreted with caution. Overall, these data suggest that variability both positive and negative affect are associated with trait anxiety and that variability of negative may be associated with trait anxiety.

**DynAffect approach: depression severity and positive affect.** We first performed a simultaneous multiple regression to test whether positive affect homebase, variability and attractor predicted individual differences in depression. No parameters were uniquely associated with depression ($p$'s $> 0.1$). Because researchers have suggested that there is an anhedonic subtype of MDD (Watson et al., 1995), we followed this initial analysis by extracting the specific anhedonia items from the BDI to see whether they were predicted by any of the DynAffect parameters. When summing just the anhedonia items, positive affect homebase was uniquely associated with BDI-anhedonia ($B = -0.18$, $t(101) = -2.35$, $p = .02$), such that higher positive affect homebase was associated with lower depression severity. Variability and attractor were not associated with the anhedonia subscale of the BDI ($p$'s $>$ 0.36).

**DynAffect approach: depression severity and negative affect.** We then performed a simultaneous multiple regression to test whether negative affect homebase, variability and attractor predicted individual differences in depression severity. Negative affect homebase was uniquely associated with depression severity ($B = 1.34$, $t(101) = 2.47$, $p = .02$), such that higher homebase of negative affect was associated with worse depression severity while controlling for individual differences in negative affect variability and attractor. In contrast, there was no association between negative affect variability or attractor and depression severity (variability: $B = 0.57$, $t(101) = 1.44$, $p = .15$; attractor: $B = 6.01$, $t(101) = 0.21$, $p = .83$).

**DynAffect approach: depression severity and positive and negative affect.** Lastly, we included all six DynAffect parameters (positive/negative affect x homebase/variability/attractor) in the same model to predict depression severity. In this model the only significant predictor of depression severity was negative affect homebase ($B = 1.33$, $t(98) = 2.38$, $p = .02$; all other parameters, $p$'s $> 0.40$). We also included all six DynAffect parameters to predict the anhedonia subscale of the BDI. In this model, positive affect homebase was the only predictor of the BDI anhedonia subscale ($B = -0.17$, $t(98) = -2.17$, $p = .03$; all other $p$'s $> 0.25$). Overall, these data suggest that homebase of negative affect is associated with depression severity, but that positive affect homebase may be associated with severity of anhedonia.

**DynAffect approach—analyses controlling for response rate.** We also reran the tests between depression and trait anxiety with HomeBase, Variability and Attractor but controlling for response rate. Results remained identical.

## Arithmetic Approach

**Arithmetic approach: mean and instability of positive and negative effect—main effects.** In the sample, mean positive affect higher than mean negative affect (Mean$_{\text{positive affect}}$: 6.00, mean$_{\text{negative affect}}$: 2.90; $t(104) = 16.04$, $p < .001$). In contrast, negative affective instability was higher than positive affect instability

(Instability$_{\text{positive affect}}$: 2.34, Instability$_{\text{negative affect}}$: 2.60, $t(104) = 2.17$, $p = .03$).

**Arithmetic approach: relationships between individual differences in positive and negative affect.** Table 2 displays the zero-order correlations between the estimates of baseline and instability of positive and negative affect as well as STAI and BDI. EMA measures of mean and instability of positive and negative affect were all associated with both depression and anxiety. Higher mean positive affect was protective as it was associated with lower levels of depression and anxiety, while higher mean negative affect was a risk factor for higher levels of depression and anxiety. In contrast, higher levels of instability of positive and negative affect were both risk-factors as they were independently associated with higher levels of depression and anxiety.

Next we examined whether specific features of positive and negative emotion are associated with depression and anxiety separately, we performed separate multiple regression analyses to examine whether mean and instability of positive affect predicts depression versus anxiety and separately whether mean and instability of negative affect differentially predicts depression versus anxiety.

**Arithmetic approach: relationships between EMA positive and negative emotion, depression, and anxiety.** To examine whether specific features of positive and negative emotion are associated with depression and anxiety separately, we performed separate multiple regression analyses to examine whether mean and instability of positive affect differentially predicts depression versus anxiety and separately whether mean and instability of negative affect differentially predicts depression versus anxiety.

**Arithmetic approach: trait anxiety and positive affect.** First, we performed a simultaneous multiple regression to test whether mean positive affect and positive affect instability (MSSD) predicted trait anxiety. Positive affect instability was associated with trait anxiety ($B = 1.40$, $t(102) = 2.60$, $p = .02$), such that higher instability of positive affect was associated with worse anxiety while controlling for individual differences in mean positive affect. In contrast, there was no association between mean positive affect and trait anxiety ($B = -0.78$, $t(102) = -1.03$, $p = .31$), when controlling for positive affect instability.

**Arithmetic approach: trait anxiety and negative affect.** We then performed a simultaneous multiple regression to test whether mean negative affect and instability of negative affect predicted trait anxiety. Instability of negative affect was not significantly associated with trait anxiety ($B = 0.88$, $t(102) = 1.99$, $p = .066$) despite being in the same direction as other analyses testing for associations between negative affect instability and trait anxiety. In this model, there was also an association between mean negative affect trait anxiety ($B = 2.73$, $t(102) = 3.32$, $p = .001$), when controlling for mean negative affect, indicating that higher mean negative affect is associated with worse anxiety while controlling for negative affect instability. Overall, these data suggest that instability in positive affect is uniquely associated with anxiety, while both average and instability of negative affect are both associated with trait anxiety.

**Arithmetic approach: trait anxiety and positive and negative affect.** Lastly, we included all four parameters (positive/negative affect x mean/instability) in the same model to predict trait anxiety. In this model the only significant predictor of trait anxiety was mean negative affect ($B = 2.69$, $t(100) = 3.19$, $p = .002$). None of the other factors significantly predicted trait anxiety ($p$'s $> 0.31$).

**Arithmetic approach: depression severity and positive affect.** First, we performed a simultaneous multiple regression to test whether mean positive affect and instability of positive affect predicted depression severity. Mean positive affect was not associated with depression severity ($B = -0.83$, $t(102) = -1.86$, $p = .06$), although in the same direction as previous analyses, broadly suggesting that higher mean positive affect may be associated with lower levels of depression while controlling for individual differences in positive affect instability. In contrast, in this model there was no association between positive affect instability and depression severity ($B = 0.47$, $t(102) = 1.49$, $p = .14$), when controlling for mean positive affect. When summing just the anhedonia items, mean positive was not associated with BDI-anhedonia ($B = -0.13$, $t(102) = -1.80$, $p = .07$), despite being in the same overall direction. Taken together, this suggests that higher mean positive affect may be associated with lower depression severity. Positive affect instability was not associated with the anhedonia subscale of the BDI ($p > .53$).

**Arithmetic approach: depression severity and negative affect.** We then performed a simultaneous multiple regression to test whether mean negative affect and negative affect instability predicted depression severity. Mean negative was associated with BDI ($B = 1.89$, $t(102) = 3.99$, $p < .001$), such that higher mean

Table 2
*Estimates from Regression Models Using Both Approaches*

| DynAffect Approach | β-HomeBase (*t*-Value) | β-Variability (*t*-Value) | β-Attractor (*t*-Value) |
|---|---|---|---|
| Positive affect and Trait Anxiety | .32 (.38) | 2.04 (2.40)* | 21.21 (.32) |
| Positive affect and Depression | −.58 (−1.19) | .80 (1.64) | 19.90 (.53) |
| Negative affect and Trait Anxiety | .45 (.47) | 1.71 (2.42)* | 27.88 (.55) |
| Negative affect and Depression | 1.34 (2.47)* | .57 (1.44) | 6.01 (.21) |

| Arithmetic Approach | β−Mean (*t*−value) | β−Instability (*t*−value) |
|---|---|---|
| Positive affect and Trait Anxiety | −.78 (−1.03) | 1.40 (2.60)* |
| Positive affect and Depression | −.83 (−1.86)[a] | .47 (1.49) |
| Negative affect and Trait Anxiety | 2.73 (3.32)*** | .88 (1.99)* |
| Negative affect and Depression | 1.89 (3.99)*** | .32 (1.25) |

[a] $p < .10$.
* $p < .05$. ** $p < .01$. *** $p < .001$.

negative was associated with worse depression while controlling for individual differences in negative affect instability. In this model there was no association between negative affect instability and depression severity ($B = 0.32$, $t(102) = 1.25$, $p = .21$), when controlling for mean negative affect. Overall, these data suggest that the emotional mean of both positive and negative affect are associated with depression severity, while neither emotional instability of positive or negative affect depression severity.

**Arithmetic approach: depression severity and positive and negative affect.** Lastly, we included all four parameters (positive/negative affect x mean/instability) in the same model to predict individual differences in depression. In this model the only significant predictor of depression was mean negative affect ($B = 1.78$, $t(100) = 3.69$, $p < .001$). None of the other factors significantly predicted depression severity ($p$'s $> 0.22$).

**Arithmetic approach—analyses controlling for response rate.** We also reran the tests between depression and trait anxiety with mean and instability but controlling for response rate. Results were the same, but the effect size for the association between negative affect instability and trait anxiety decreased slightly ($B = 0.85$, $t(101) = 1.91$, $p = .59$), rendering the association nonsignificant.

Lastly, we performed an analysis to examine whether there were significant differences between the parameter estimates of emotional dynamics predicting depression or anxiety. We used the method suggested by Cohen, Cohen, West, & Aiken (2013), Appendix 2; (Cohen, Cohen, West, & Aiken, 2013). To do this, we z-scored all variables. Then we performed one regression (e.g., using the DynAffect model and regressed ~~Trait Anxiety~~ on Negative Affect). We then extracted the fitted (i.e., predicted) values from that regression and subtracted from the fitted values the other DV (in this example, the scaled BDI). This difference was then used as the DV in another regression model using the same IVs. Using this approach, the only factor that differentially predicted anxiety and depression was the negative affect home base from the DynAffect Approach which appeared to more strongly predict depression than anxiety (BDiff $= 0.22$, $t(101) = 1.99$, $p = .049$). This effect was not present for the AirthmeticApproach of mean NA (BDiff $= 0.67$, $t(101) = 0.69$, $p = .51$).

## Discussion

Despite a long-stated interest in examining the temporal dynamics of positive and negative emotion and their relationship to risk for psychopathology, affective science has only recently begun to examine which specific affective dynamics are predictive of that risk (Davidson, 1998; Solomon & Corbit, 1974). The development of mobile technology to assess individuals longitudinally as they go about their daily life has facilitated ~~this research~~ and has begun to suggest that the instability, mean and capacity to regulate current levels of positive and negative emotion are associated with risk for mood disorders. Here, we test whether specific parameters of positive and negative emotional dynamics are associated with risk for anxiety and depression. Participants responded to multiple prompts per day over a 10-day period. Across two different analytic approaches, we generally found that great instability/variability of both positive and negative emotion were associated with trait anxiety but not risk for depression. In contrast mean levels of positive and negative emotion (but not instability/variability) were associated with depression risk but not anxiety. However, these effects did not hold when including all factors into regression models (PA/NA, mean/instability).

These data suggest that features of emotional dynamics may be uniquely associated with risk for depression and anxiety. In some ways these results fit with certain existing diagnostic criteria for depression and anxiety: depression is typically defined in both self-reports of depression and in the Diagnostic & Statistical Manual (American Psychiatric Association, 2013) as low overall mood. This is essentially what is captured as high mean negative affect or a higher negative affective homebase. That trait anxiety was more uniquely associated with affective instability/variability is somewhat more surprising although not completely. Broadly speaking, the process of worry, which is core to generalized anxiety is a future oriented cognitive process characterized by repetitive negative thinking (Davidson, Fox, & Kalin, 2007; Ehring et al., 2011; Mennin, Heimberg, Turk, & Fresco, 2005). There is some evidence that heightened instability of negative affect is present in individuals with PTSD and panic disorder (Pfaltz et al., 2010). Most of the previous work examining the specific role of affective instability in risk for psychopathology has examined individuals with borderline personality disorder. In this domain, several reports have indicated that emotional instability is a key feature of patients with borderline personality (Ebner-Priemer et al., 2015; Santangelo, Bohus, & Ebner-Priemer, 2014). Nonetheless, the application of these methods to assess parameters underlying emotional dynamics in ~~anxiety and~~ risk for anxiety is still emerging.

When including all variables into the models to predict either depression or anxiety, things became much more complicated. Because of the high inverse correlation between mean/home base NA and PA and high positive correlation between variability/instability NA and PA, it was difficult to ascertain the unique effect of valence in the models. In general, however, when all predictors were included, negative affect mean/home-base appeared to account for the most unique variance in both depression and anxiety risk. This may be in part attributable to the fact that negative affect is core to both depression and anxiety. As a result, the full extent of the specificity of these results should be treated with some caution.[1] Fn1

Nonetheless, a feature of the results presented here is that they broadly cohered across two different methodological approaches: the Baysiean Ornstein-Uhlenbeck Model (BOUM) which is an approach that models perpetually altering states of the core affect that accounts for the temporal changes in positive and negative affect on the latent level (Oravecz, Tuerlinckx, & Vandekerckhove, 2011), and more typical arithmetic approaches of mean and mean square of successive differences (von Neumann et al., 1941) to assess affective instability. That these two approaches largely cohered in their results provides greater confidence in the results. This was particularly the case for the association between vari-

[1] We also ran analyses examining associations between dynamic parameters and depression, controlling for anxiety. There appeared to be a particularly strong association between mean negative affect and depression, controlling for trait anxiety across both approaches (DynAffect: $B = 1.15$ $t(102) = 3.13$, $p < .01$; Arithmetic: $B = 0.83$ $t(102) = 2.24$, $p < .05$). These results were not reported in the main text because of high collinearity between BDI and trait-anxiety.

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ability/instability in both positive and negative affect and trait anxiety, as well as the association between mean/homebase negative affect and depression. However, these approaches did come to somewhat different results in a few instances, namely with regard to mean/homebase positive affect and depression as well as mean negative affect and anxiety. Where regression models showed nonidentical results, they were in the same direction, but one model was "significant" ($p < .05$), while the other was not. From a theoretical standpoint, the strongest evidence is unquestionably seen when there is convergence across techniques. However, when the two techniques disagree we are more hesitant to make strong inferences.

A limitation is the lack of a group with a diagnosed anxiety or depressive disorder. As a result, it is unclear whether the relationship between these dynamic parameters and individual differences in depression and anxiety would be present in individuals with clinically relevant generalized anxiety and/or depression. A follow-up study with patients with depression and anxiety would be essential. Nonetheless, the approach taken here, to statistically parse affective dynamics into unique parameters to test hypotheses that specific affective dynamics are associated with risk for psychopathology is novel. Given the fact that anxiety often precedes depression, these data raise the question of whether the affective instability that is associated with anxiety simply shuts down if an individual transitions into a depressed state. There is some evidence for this hypothesis, as emerging evidence suggests that transitions between emotional states begin to slow and individuals enter depressive episodes (van de Leemput et al., 2014) – thus by definition affective instability begins to contract.

Emotional dysregulation is thought to underlie risk for both anxiety and depressive disorders (Shackman et al., 2016). It has been suggested that how emotional experiences unfold over time may be one way to better characterize and distinguish individual differences in depression and anxiety. In a normative sample using EMA, individuals differences in trait anxiety were associated with increased instability of positive and negative affect whereas mean levels of negative affect was broadly associated with individual differences in depression. Mean levels of positive affect were specifically associated with individual differences in anhedonia. These data provide evidence that the emotional dysregulation underlying risk for mood versus anxiety disorders unfolds in distinct ways and highlights the utility in examining affective dynamics to understand psychopathology.

## References


American Psychiatric Association. (2013). *DSM-V: Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Association.

Beck, A. T., & Steer, R. A. (1987). *BDI, Beck Depression Inventory: Manual*. San Antonio, TX: Psychological Corp., Harcourt Brace Jovanovich.

Beck, A. T., Steer, R. A., & Carbin, M. G. (1988). Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. *Clinical Psychology Review, 8,* 77–100. http://dx.doi.org/10.1016/0272-7358(88)90050-5

Carpenter, R. W., & Trull, T. J. (2013). Components of emotion dysregulation in borderline personality disorder: A review. *Current Psychiatry Reports, 15,* 335. http://dx.doi.org/10.1007/s11920-012-0335-2

Clark, L. A., & Watson, D. (1991). Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology, 100,* 316–336. http://dx.doi.org/10.1037/0021-843X.100.3.316

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2013). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. New York, NY: Routledge.

Davidson, R. J. (1998). Affective style and affective disorders: Perspectives from affective neuroscience. *Cognition and Emotion, 12,* 307–330. http://dx.doi.org/10.1080/026999398379628

Davidson, R. J., Fox, A., & Kalin, N. H. (2007). Neural bases of emotion regulation in nonhuman primates and humans. In J. J. Gross (Ed.), *Handbook of Emotion Regulation,* 47–68. New York, NY: Guilford Press.

Ebner-Priemer, U. W., Eid, M., Kleindienst, N., Stabenow, S., & Trull, T. J. (2009). Analytic strategies for understanding affective (in)stability and other dynamic processes in psychopathology. *Journal of Abnormal Psychology, 118,* 195–202. http://dx.doi.org/10.1037/a0014868

Ebner-Priemer, U. W., Houben, M., Santangelo, P., Kleindienst, N., Tuerlinckx, F., Oravecz, Z., . . . Kuppens, P. (2015). Unraveling affective dysregulation in borderline personality disorder: A theoretical model and empirical evidence. *Journal of Abnormal Psychology, 124,* 186–198. http://dx.doi.org/10.1037/abn0000021

Ehring, T., Zetsche, U., Weidacker, K., Wahl, K., Schönfeld, S., & Ehlers, A. (2011). The Perseverative Thinking Questionnaire (PTQ): Validation of a content-independent measure of repetitive negative thinking. *Journal of Behavior Therapy and Experimental Psychiatry, 42,* 225–232. http://dx.doi.org/10.1016/j.jbtep.2010.12.003

Houben, M., Van Den Noortgate, W., & Kuppens, P. (2015). The relation between short-term emotion dynamics and psychological well-being: A meta-analysis. *Psychological Bulletin, 141,* 901–930. http://dx.doi.org/10.1037/a0038822

Kahneman, D., & Krueger, A. B. (2006). Developments in the measurement of subjective well-being. *The Journal of Economic Perspectives, 20,* 3–24. http://dx.doi.org/10.1257/089533006776526030

Kaplan, R. M., & Stone, A. A. (2013). Bringing the laboratory and clinic to the community: Mobile technologies for health promotion and disease prevention. *Annual Review of Psychology, 64,* 471–498. http://dx.doi.org/10.1146/annurev-psych-113011-143736

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Koretz, D., Merikangas, K. R., . . . the National Comorbidity Survey Replication. (2003). The epidemiology of major depressive disorder: Results from the National Comorbidity Survey Replication (NCS-R). *JAMA: Journal of the American Medical Association, 289,* 3095–3105. http://dx.doi.org/10.1001/jama.289.23.3095

Kuppens, P., Oravecz, Z., & Tuerlinckx, F. (2010). Feelings change: Accounting for individual differences in the temporal dynamics of affect. *Journal of Personality and Social Psychology, 99,* 1042–1060. http://dx.doi.org/10.1037/a0020962

Mennin, D. S., Heimberg, R. G., Turk, C. L., & Fresco, D. M. (2005). Preliminary evidence for an emotion dysregulation model of generalized anxiety disorder. *Behaviour Research and Therapy, 43,* 1281–1310. http://dx.doi.org/10.1016/j.brat.2004.08.008

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking Rumination. *Perspectives on Psychological Science, 3,* 400–424. http://dx.doi.org/10.1111/j.1745-6924.2008.00088.x

Oravecz, Z., Tuerlinckx, F., & Vandekerckhove, J. (2009). A Hierarchical Ornstein–Uhlenbeck Model for Continuous Repeated Measurement Data. *Psychometrika, 74,* 395–418. http://dx.doi.org/10.1007/s11336-008-9106-8

Oravecz, Z., Tuerlinckx, F., & Vandekerckhove, J. (2011). A hierarchical latent stochastic differential equation model for affective dynamics. *Psychological Methods, 16,* 468–490. http://dx.doi.org/10.1037/a0024375

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Pfaltz, M. C., Michael, T., Grossman, P., Margraf, J., & Wilhelm, F. H. (2010). Instability of physical anxiety symptoms in daily life of patients with panic disorder and patients with posttraumatic stress disorder. *Journal of Anxiety Disorders, 24,* 792–798. http://dx.doi.org/10.1016/j.janxdis.2010.06.001

Pizzagalli, D. A., Jahn, A. L., & O'Shea, J. P. (2005). Toward an objective characterization of an anhedonic phenotype: A signal-detection approach. *Biological Psychiatry, 57,* 319–327. http://dx.doi.org/10.1016/j.biopsych.2004.11.026

Redelmeier, D. A., Katz, J., & Kahneman, D. (2003). Memories of colonoscopy: A randomized trial. *Pain, 104*(1), 187–194. http://dx.doi.org/10.1016/S0304-3959(03)00003-4

Santangelo, P., Bohus, M., & Ebner-Priemer, U. W. (2014). Ecological momentary assessment in borderline personality disorder: A review of recent findings and methodological challenges. *Journal of Personality Disorders, 28,* 555–576. http://dx.doi.org/10.1521/pedi_2012_26_067

Santangelo, P., Reinhard, I., Mussgay, L., Steil, R., Sawitzki, G., Klein, C.,
AQ: 3 . . . Ebner-Priemer, U. W. (2014). Specificity of affective instability in patients with borderline personality disorder compared to posttraumatic stress disorder, bulimia nervosa, and healthy controls. *Journal of Abnormal Psychology, 123,* 258–272. http://dx.doi.org/10.1037/a0035619

Shackman, A. J., Tromp, D. P. M., Stockbridge, M. D., Kaplan, C. M., Tillman, R. M., & Fox, A. S. (2016). Dispositional negativity: An integrative psychological and neurobiological perspective. *Psychological Bulletin, 142,* 1275–1314. http://dx.doi.org/10.1037/bul0000073

Solomon, R. L., & Corbit, J. D. (1974). An opponent-process theory of motivation. I. Temporal dynamics of affect. *Psychological Review, 81,* 119–145. http://dx.doi.org/10.1037/h0036128

Spielberger, C. D. (1983). *Manual for the State-Trait Anxiety Inventory STAI (Form Y) ("Self-Evaluation Questionnaire").* Retrieved from http://ubir.buffalo.edu/xmlui/handle/10477/1873

Trull, T. J., Lane, S. P., Koval, P., & Ebner-Priemer, U. W. (2015). Affective Dynamics in Psychopathology. *Emotion Review, 7,* 355–361. http://dx.doi.org/10.1177/1754073915590617

van de Leemput, I. A., Wichers, M., Cramer, A. O. J., Borsboom, D., Tuerlinckx, F., Kuppens, P., . . . Scheffer, M. (2014). Critical slowing down as early warning for the onset and termination of depression. *Proceedings of the National Academy of Sciences of the United States of America, 111,* 87–92. http://dx.doi.org/10.1073/pnas.1312114110

von Neumann, J., Kent, R., Bellinson, H., & Hart, B. (1941). The mean square successive difference. *Annals of Mathematical Statistics, 12,* 153–162. http://dx.doi.org/10.1214/aoms/1177731746

Watson, D., Weber, K., Assenheimer, J. S., Clark, L. A., Strauss, M. E., & McCormick, R. A. (1995). Testing a tripartite model: I. Evaluating the convergent and discriminant validity of anxiety and depression symptom scales. *Journal of Abnormal Psychology, 104,* 3–14. http://dx.doi.org/10.1037/0021-843X.104.1.3

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