Supplementary Information for: Neuroticism May Not Reflect Emotional Variability

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Part 1: Additional Details of Study Methods

Table S1 outlines additional details about the study design and context for each of the 11 datasets used in our research. Table S2 includes more information about the measurement and reliability of negative emotion and neuroticism.

Table S1. Additional Details about Study Design and Context for Each Dataset.

Dataset	Sampling schedule	Mean number of observations per participant	Context of broader study	Country	Sample	Exclusions
1	End of day	14.00	Healthy controls from a study examining affect regulation in Fibromyalgia	Belgium	Healthy participants recruited from the community	Initial N=49. Excluded 1 equipment failure, 1 outlier on HRV, 1 low compliance
2	End of day	27.60	Depressive symptoms and social expectancies about emotion	United States	Mturk participants above PHQ-2 clinical cut-off for depression	Initial N=121. Excluded 9 low compliance
3	End of day	6.83	Emotion in daily negative events	United States	Mturk participants selected to maximize variation on neuroticism	Initial N=121. Excluded 1 for missing attention checks, 8 low compliance*
4	Stratified random interval in a 12-hour period	199.40	Emotion in daily life	Australia	Community members	Initial N=186. 7 withdrew, excluded 3 low compliance
5	Stratified random interval between 10am and 10pm	70.49	Emotion in students starting university: wave 1 of longitudinal study	Belgium	Students, sample stratified on depressive symptoms	Initial N=202. Excluded 2 low compliance
6	Stratified random interval between 10am and 10pm	66.64	Emotion in daily life	Belgium	Students, sample stratified on depressive symptoms	Initial N=100. 1 withdrew, excluded 3 technical problems**
7	Stratified random interval between	71.22	Sexual objectification in women	Australia	Women recruited online and at	Initial N=82. 1 withdrew, excluded 2

	10 am and midnight				university campus	low compliance
8	Stratified random interval between 10 am and midnight	72.21	Sexual objectification in women	Australia	Women recruited online and at university campus	Initial N=90. 1 withdrew, excluded 2 because previously participated in dataset 7 study, 2 low compliance
9	Stratified random interval between 10 am and midnight	71.94	Sexual objectification in women	United States	Women recruited online and at university campus	Initial N=100. Excluded 3 low compliance
10	Stratified random interval, between 10am and 10pm	98.00	Emotion regulation in daily life	Belgium	Community	Initial N=104. Excluded 4 low compliance
11	Stratified random interval, between 10am and 10pm	90.12	Emotion among students 2 days before and 7 days after receiving first semester exam results	Belgium	First-year psychology students	None

Notes. Low compliance = completed less than 50% of observations. *Previous studies with these data used N = 114, because diaries without negative events were removed *after* removing low compliance participants. In this study we removed the diaries without negative events *before* removing low compliance participants, resulting in the removal of two participants who fell under the compliance threshold only when their non-negative events were removed. **Previous studies used N = 95, excluding one additional participant for low compliance. We do not exclude this participant because we calculated compliance for each participant based on the number of surveys actually received by that particular participant, rather than the maximum number of surveys that they could have possibly received. Some participants received slightly fewer surveys depending on the time of day they completed their baseline session.

Table S2. Additional Information about the Measurement of Negative Emotion and Neuroticism in each Dataset.

	Negative emotion					**Neuroticism**	
	Emotions assessed	*Item stem*	*Original response scale*	*Reliability*			
Dataset				Between-person R_{KF}	Within-person R_C	*Scale*	*Reliability* (α)
1	Angry, Afraid, Sad, Anxious, Irritated, Nervous,	To what extent do you agree with the following	7-point Likert 0 = *do not agree at all*	.99	.86	TIPI	.42

	Dejected, Frustrated, Hopeless, Infuriated, Powerless	statements? Today I felt _____	6 = *totally agree*				
2	Angry, Sad, Stressed	Today, to what extent did you feel ____?	7-point Likert 1 = *not at all* 7 = *very much*	.99	.80	TIPI	.83
3	Angry, Afraid, Sad, Irritated, Nervous, Depressed, Guilty, Ashamed	To what extent did you feel each of the following emotions during the event you recalled earlier?	7-point Likert 1 = *not at all* 7 = *very much*	.96	.72	BFI	.95
4	Angry, Sad, Stressed	How ____ do you feel right now?	0 = *not at all [emotion]* *100 = very [emotion]*	.99	.62	BFI	.84
5	Angry, Sad, Stressed, Anxious, Depressed	How ____ do you feel at the moment?	100- point slider 1 = *not at all* 100 = *very much*	.99	.72	TIPI	.59
6	Angry, Sad, Stressed, Anxious, Depressed	How ____ do you feel at the moment?	100-point slider 1 = *not at all [emotion]* 100 = *very [emotion]*	.99	.74	TIPI	.71
7	Angry, Sad, Anxious, Guilty	Right now, how ____ do you feel?	100-point slider 1 = *not at all [emotion]* 100 = *very [emotion]*	.99	.62	BFI	.84
8	Angry, Afraid, Sad, Anxious, Embarrassed, Guilty, Ashamed	Right now, how ____ do you feel?	100-point slider 1 = *not at all [emotion]* 100 = *very [emotion]*	.99	.76	TIPI	.55
9	Angry, Afraid, Sad, Anxious, Embarrassed, Guilty, Ashamed	Right now, how ____ do you feel?	100-point slider 1 = *not at all [emotion]* 100 = *very [emotion]*	.99	.75	TIPI	.68
10	Angry, Sad, Stressed	How ____ did you feel during the event?	100-point slider 1 = *not at all [emotion]* 100 = *very [emotion]*	.99	.62	BFI	.83
11	General negative affect	Please indicate how negative you are feeling right now	100-point slider 0 = *neutral* 100 = *very negative*	-	-	BFI	.88

Note. Reliability for negative emotion is not provided for dataset 11, since it was assessed with a single item. For negative emotion, we calculated within- and between-person reliability using equations from Shrout and Lane (2012) implemented in the psych package in R (Revelle, 2017). Between-person reliability (R_{KF}) is the consistency of item responses over time and across people, Within-person reliability (R_C) is the consistency between items within individuals. For neuroticism, reliability is assessed using Cronbach's alpha. TIPI = Ten Item Personality Inventory. BFI = Big Five Inventory

Part 2: Descriptive Statistics

Table S3 displays descriptive statistics for neuroticism and negative emotion for each dataset.

Table S3. Descriptive Statistics for Negative Emotion and Neuroticism

Dataset	**Negative Emotion**					**Neuroticism**
	M	Between *SD*	Average Within *SD*	Average daily maximum	Average Relative variability index	*M* (*SD*)
1	2.19	0.94	0.72	-	0.39	3.24 (1.26)
2	3.52	1.09	1.03	-	0.38	4.42 (1.77)
3	2.85	0.96	0.70	-	0.27	3.66 (1.66)
4	2.33	0.81	0.80	3.37	0.36	3.94 (1.20)
5	1.86	0.51	0.58	2.69	0.29	3.27 (1.32)
6	2.00	0.67	0.62	2.90	0.30	3.37 (1.52)
7	2.28	0.83	0.73	3.33	0.34	4.14 (1.20)
8	1.65	0.71	0.51	2.47	0.33	3.30 (1.32)
9	1.69	0.68	0.50	2.48	0.31	3.59 (1.48)
10	1.96	0.55	0.80	2.62	0.35	4.25 (1.06)
11	2.19	0.81	0.98	2.98	0.39	4.49 (1.66)

Part 3: Analyses Using the MSSD

In the main text, we focused on emotional variability assessed using the within-person standard deviation of negative emotion. Here, we replicate our main analyses with the Mean Squared Successive Difference (MSSD) between consecutive negative emotion scores, an indicator of moment-to-moment instability that is positively associated with neuroticism but suffers from the same dependency with the mean as the within-person *SD*. Analyses are conducted exactly as reported in the main text, except substituting MSSD in place of the within-person *SD*. Below, we show that the results for the MSSD echo those demonstrated with the within-person *SD* reported in the main text.

In all meta-analytic forest plot figures, we provide a correlation bounded by a 95% confidence interval (CI) for each dataset. The area of each square is proportional to the weight of the study in the meta-analysis. The results of the random effects meta-analysis are depicted at the bottom of the figure (RE model), with the width of the rhombus representing the 95% CI. The dotted line represents no effect.

Figure S1 provides the results of a meta-analysis of the relationship between neuroticism and the MSSD of negative emotion, with no correction for mean negative emotion. Replicating previous work, neuroticism had a significant positive correlation with negative emotion instability as conceptualized with the MSSD.

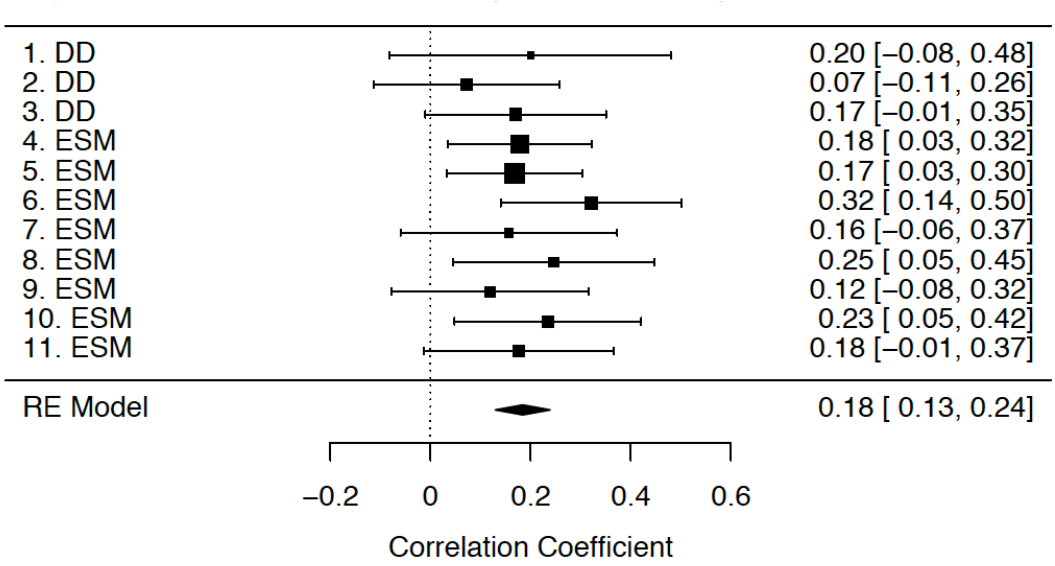

Figure S1. Forest plot of the association between neuroticism and the MSSD of negative emotion.

Figure S2 provides the results of a meta-analysis of the relationship between neuroticism and instability in the maximum daily negative emotion for the experience sampling datasets (where there were multiple measurements of negative emotion per day). Here, we found no relationship between neuroticism and the MSSD based on the daily maximum.

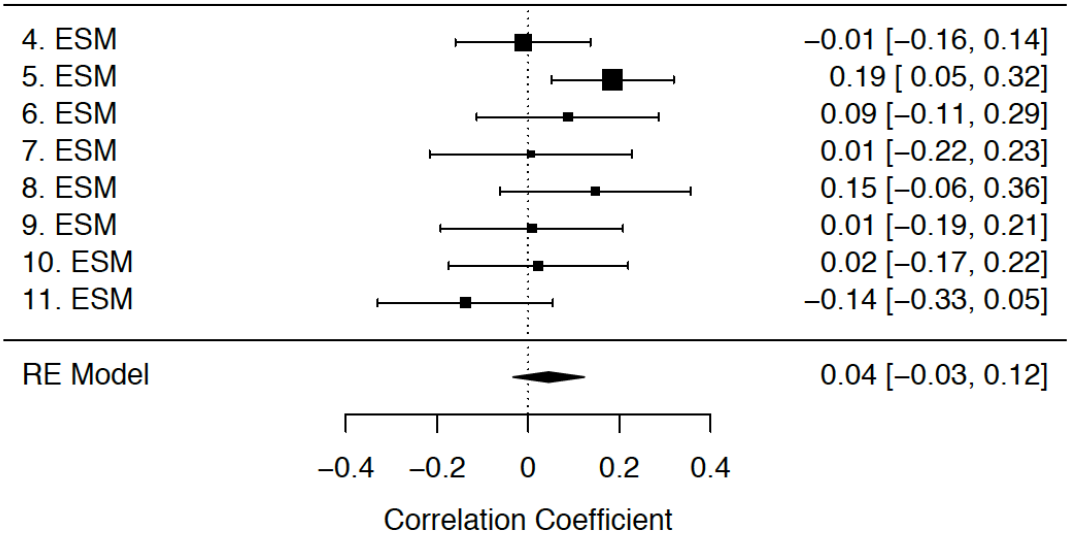

Figure S2. Forest plot of the association between neuroticism and instability in maximum daily negative emotion (for experience sampling datasets with multiple measures per day only).

Figure S3 provides the results of a meta-analysis of the relationship between neuroticism and the relative instability in negative emotion. This measure statistically corrects for the confound between instability and mean levels of negative emotion. Here, we unexpectedly found a small negative association, such that low neuroticism was associated with higher relative MSSD. When correcting for the mean, less neurotic people actually showed more unstable negative emotions.

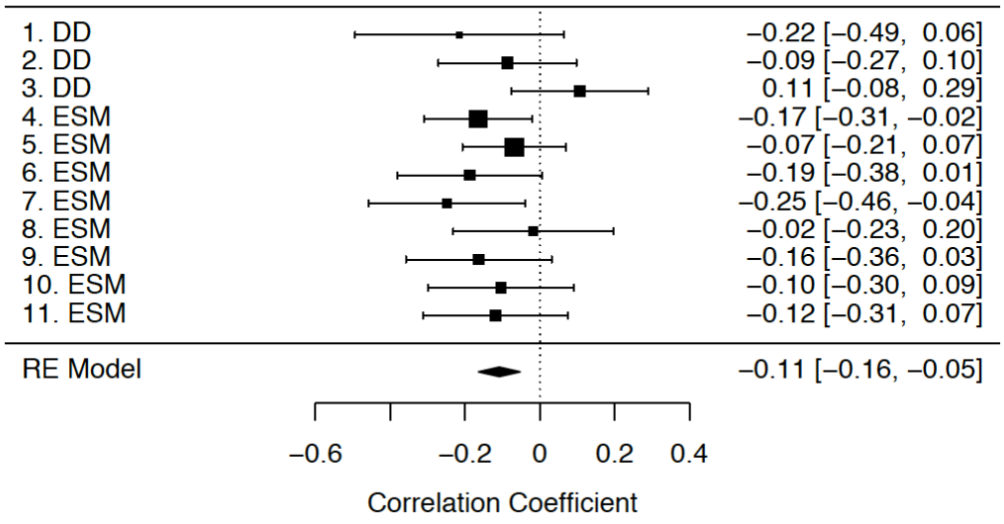

Figure S3. Forest plot of the association between neuroticism and relative instability in negative emotion.

Part 4: Separate Analyses for BFI and TIPI

Here, we present the results of the main sets of analyses separately for datasets using the Big Five Inventory (BFI) and the Ten Item Personality Inventory (TIPI) to measure neuroticism. Results are similar for the two groups of datasets, suggesting that our findings are not driven by reliability issues with the TIPI.

In all meta-analytic forest plot figures, we provide a correlation bounded by a 95% confidence interval (CI) for each dataset. The area of each square is proportional to the weight of the study in the meta-analysis. The results of the random effects meta-analysis are depicted at the bottom of the figure (RE model), with the width of the rhombus representing the 95% CI. The dotted line represents no effect.

Figure S4 provides the results of a meta-analysis of the relationship between neuroticism and the within-person *SD* of negative emotion for datasets using the BFI. Figure S5 provides the same analyses for datasets using the TIPI

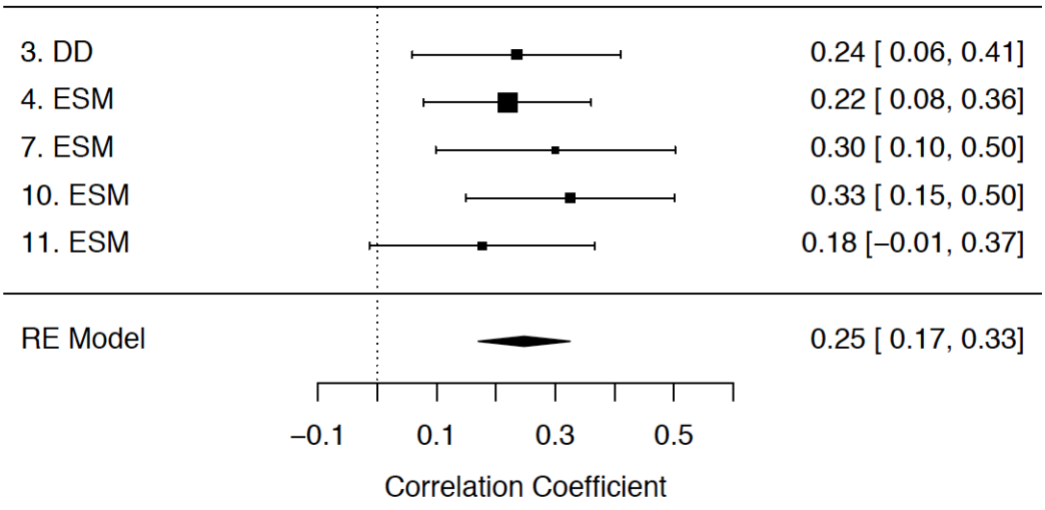

Figure S4. Forest plot of the association between neuroticism and negative emotional variability for datasets using the BFI.

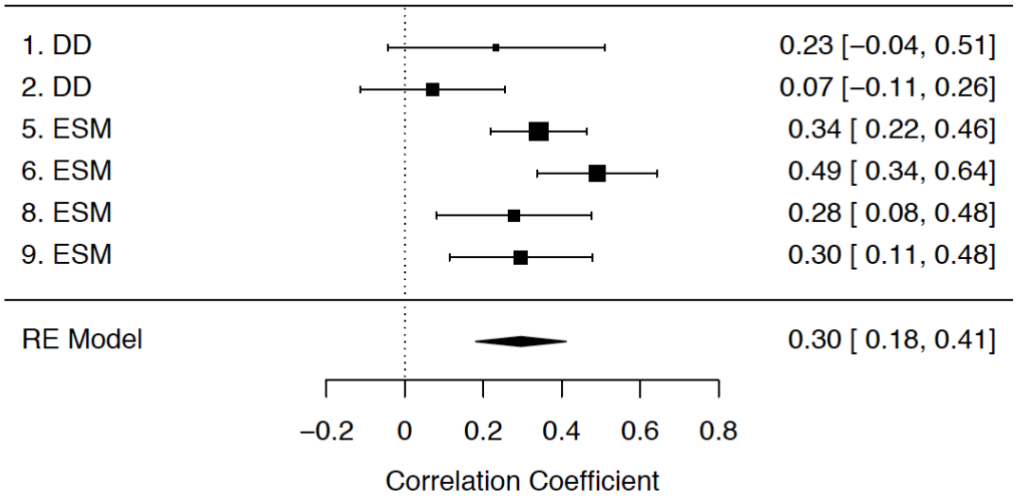

Figure S5. Forest plot of the association between neuroticism and negative emotional variability for datasets using the TIPI.

Figure S6 provides the results of a meta-analysis of the relationship between neuroticism and the within-person *SD* of the daily maximum negative emotion for datasets using the BFI. Figure S7 provides the same analyses for datasets using the TIPI.

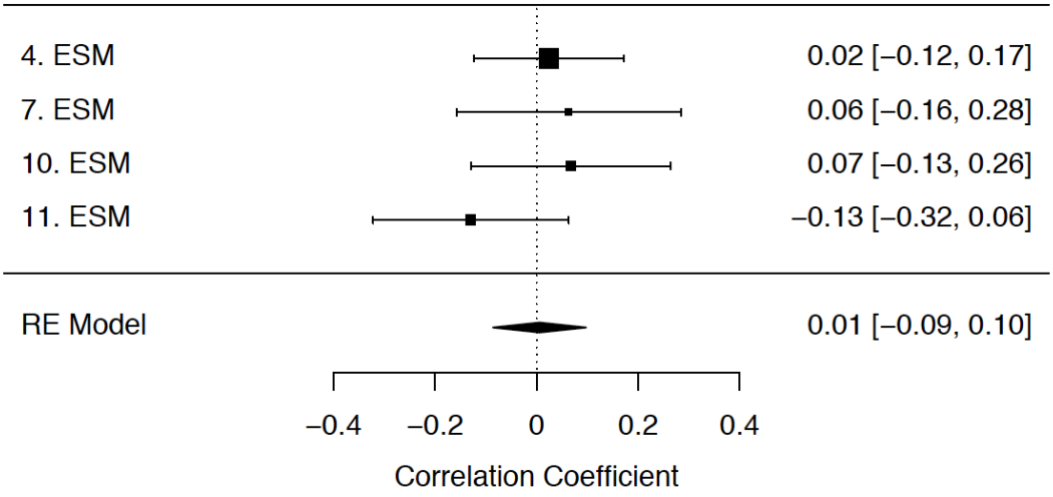

Figure S6. Forest plot of the association between neuroticism and variability in maximum daily negative emotion for datasets using the BFI.

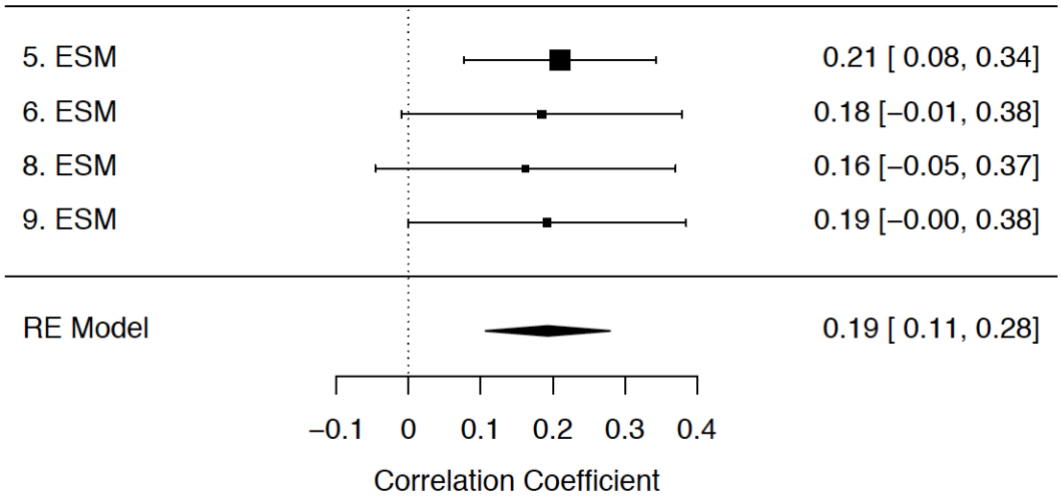

Figure S7. Forest plot of the association between neuroticism and variability in maximum daily negative emotion for datasets using the TIPI.

Figure S8 provides the results of a meta-analysis of the relationship between neuroticism and the relative variability in negative emotion for datasets using the BFI, and Figure S9 provides the results for the same analyses using the TIPI.

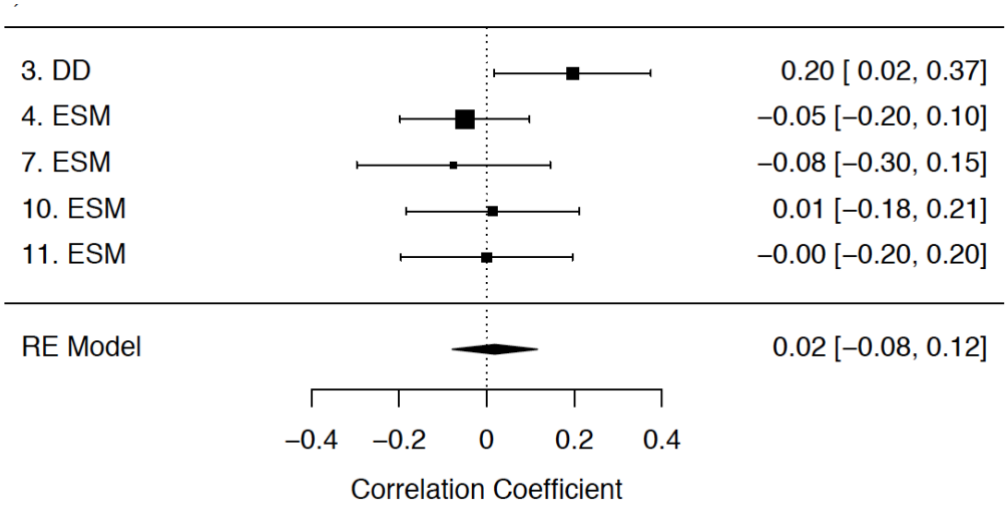

Figure S8. Forest plot of the association between neuroticism and relative variability in negative emotion for datasets using the BFI.

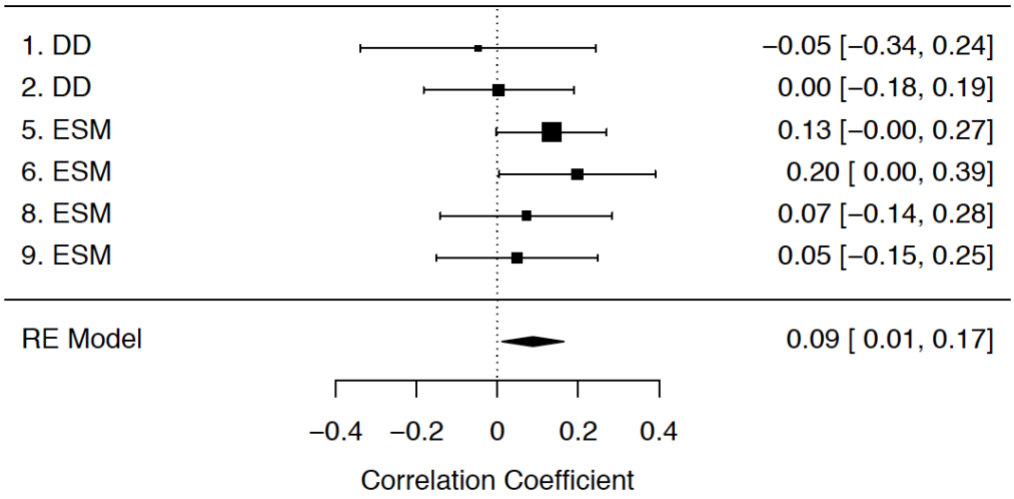

Figure S9. Forest plot of the association between neuroticism and relative variability in negative emotion for datasets using the TIPI.

Part 5: Relationship between Negative Emotion Within-Person SD Across all Time-Points and Within-Person SD for Daily Maxima

In these analyses, we investigate the relationship between the within-person *SD* across all tine-points and the within-person *SD* in the daily maxima (for the experience-sampling datasets with multiple time-points per day). This helps us understand whether variability in the daily maxima is tapping the same construct as variability across all time-points (with the major difference being that the daily max measure has less 0 scores). Figure S10 provides the results of this meta-analysis.

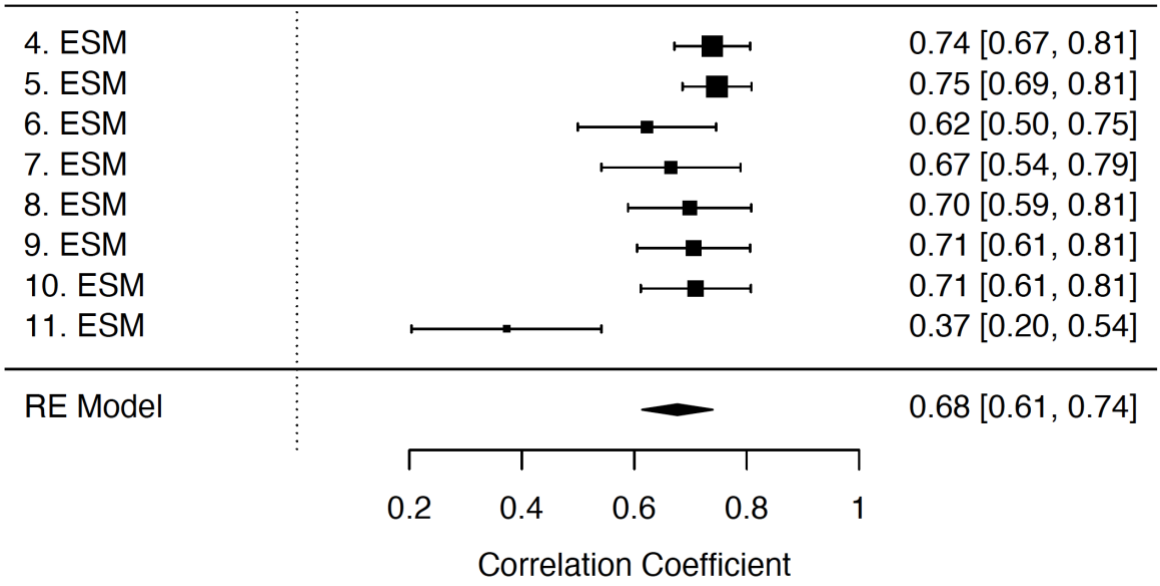

Figure S10. Forest plot of the association between variability across all time-points and variability in maximum daily negative emotion for experience-sampling datasets.

We find that there is a strong positive correlation between the two indices (r = .68), suggesting that they are partially tapping the same construct, with some differences.

Part 6: Correlation Between 1) Neuroticism and the Negative Emotion Within-Person *SD* After Partialling Out Mean Levels, and 2) Neuroticism and the Negative Emotion Mean After Partialling Out Within-Person *SD*

In these analyses, we first investigated the correlation between neuroticism and the negative emotion within-person *SD* after partialling out the effect of mean levels. These analyses are less conservative than the analysis using the relative variability index (since they do not account for potential curvilinear relationships, or for multicollinearity), but present an additional piece of evidence for the role of a mean – variability dependency clouding the relationship between neuroticism and negative emotional variability. Figure S11 provides the results of this meta-analysis.

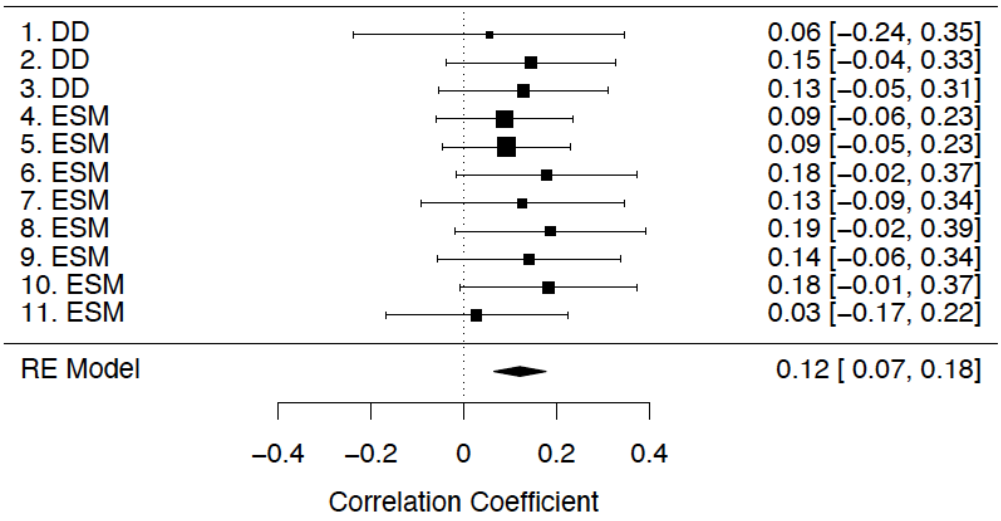

Figure S11. Forest plot of the association between neuroticism and the adjusted within-person SD of negative emotion after partialling out the effect of mean levels.

In this analysis, we found that the effect of neuroticism on the within-person *SD* was still significant but had dropped in size substantially (r = .12 from an original effect of r = .28).

We also ran the inverse analysis, investigating the correlation between neuroticism and mean levels of negative emotion after partialling out the effect of the within-person *SD*. Figure S12 provides the results of this meta-analysis.

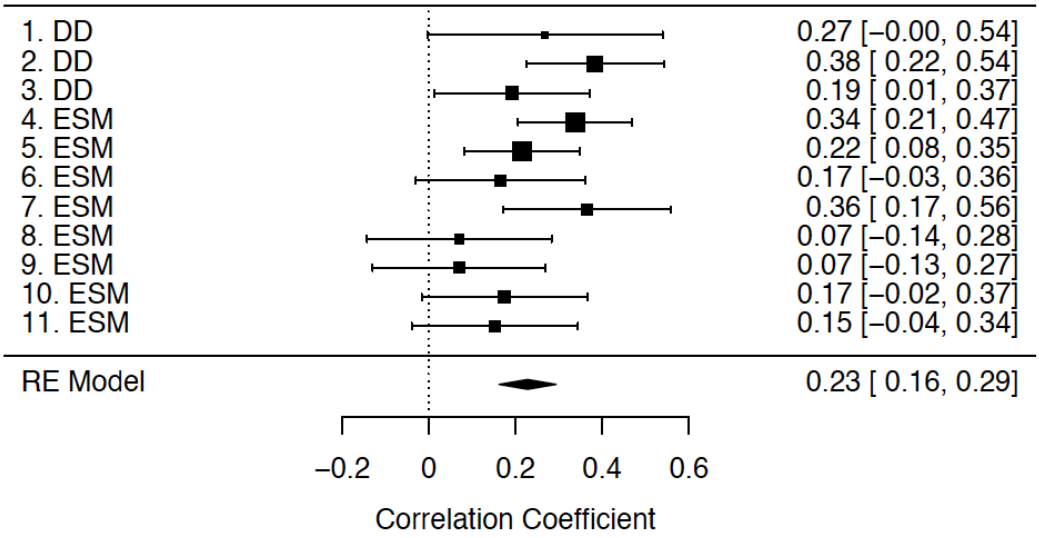

Figure S12. Forest plot of the association between neuroticism and the adjusted mean levels of negative emotion after partialling out the effect of the within-person SD.

We found that the effect of mean levels was still significant in this analysis (r =.23), although it had also dropped in size (from r = .36). The effect of neuroticism on adjusted mean levels was stronger than the effect on the adjusted within-person SD (r = .23 vs. r = .12), providing additional evidence for the primacy of the mean.