Integration of Discrete and Global Structures of Affect Across Three Large Samples:

Specific Emotions Within-Persons and Global Affect Between-Persons

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Abstract

Researchers have held a long-standing debate regarding the validity of discrete emotions versus global affect. The current manuscript tries to integrate these perspectives by explicitly examining the structures of state emotions and trait affect across time. Across three samples (sample 1: N = 176 Unites States undergraduates in a 50 day daily diary study, total observations = 7,504; sample 2: N = 2,104 in a 30 day daily diary study within a community sample in Germany; total observations = 28,090; sample 3: N = 245, ecological momentary assessment study within the United States from an outpatient psychiatry clinic completing five measurements per day for 21 days; total observations = 29,950), participants completed the Positive and Negative Affect Schedule. An exploratory multilevel factor analysis in sample 1 allowed for the simultaneous estimation of state factors (i.e., within-person factor analysis) and trait factors (i.e., between-person factor analysis). Confirmatory multilevel factor models examined the generalizability of the multilevel factor solutions to samples 2 and 3. Across all samples, the results suggested strong support for a two-factor solution for trait affect and a seven-factor solution for state emotion. Taken together, these results suggest that positive affect and negative affect can be used to describe differences across people, but at least seven differentiated emotions are experienced within persons across time.

Integration of Discrete and Global Structures of Affect:

Specific Affect Within-Persons and Global Affect Between-Persons

Emotion is fundamental to the human experience. Emotional experiences predict momentary identity, self-direction, empathy, intimacy (Roche, Jacobson, & Pincus, 2016), and experiences of pain (van Middendorp et al., 2010). In addition, the inability to identify discrete emotional experiences has been linked to depression, anxiety, and psychological distress (Marchesi, Brusamonti, & Maggini, 2000). Conversely, broad individual differences (i.e., trait-level) in predict empathy (Roche et al., 2016), job satisfaction (Judge, 1993), greater complaints of viral infections (Cohen et al., 1995), perceived stress, physical complaints, social closeness, and social dominance (Watson, 1988a). These findings suggest that differentiated emotional states and broad affective traits are important, and there is a need to recognize the contributions of both models in describing and studying emotion.

Although the definition of emotion has long been debated (see Russell & Barrett, 1999 for alternative perspectives), we use the term *emotion* to refer to highly differentiated feelings which change within-persons for purposes of the present manuscript. In defining emotions in this way, we are inherently defining emotions as *states*.[1] This broadly aligns with theory from early philosophers, such as Aristotle, Cogan, and Darwin, who suggested the presence of many discrete emotions centuries ago (Cogan, 1800; Darwin & Prodger, 1998; Konstan, 2006), as well as Tompkins and Izard within the past half-century (Izard, 2007; Izard, 1992; Tomkins, 1962). Moreover, this concept also aligns with research suggesting that emotional states have unique cardiorespiratory activity and muscular patterns (Künecke, Hildebrandt, Recio, Sommer, &

[1] Note that we are *not* defining emotions as discrete entities (i.e. which may imply that emotions to be uncorrelated [i.e. orthogonal] with one another). Rather, we are proposing that some emotions as they are defined here may show some correlation with other emotions, but these emotions evidence discriminant validity from one another.

Wilhelm, 2014; Rainville, Bechara, Naqvi, & Damasio, 2006), can be manipulated independently from one another (Ekman, Levenson, & Friesen, 1983; Lench, Flores, & Bench, 2011; Levenson, Ekman, & Friesen, 1990), and evidence discriminant validity between discrete emotions within daily life (Trampe, Quoidbach, & Taquet, 2015; Vansteelandt, Van Mechelen, & Nezlek, 2005; Zelenski & Larsen, 2000). Thus, disparate fields of evidence provide clear and convincing causal evidence that emotions at state levels are experienced distinctively in both the laboratory and in daily life.

In contrast to emotion, we define *affect* as an inherently broadly invariant individual difference (i.e., between-persons) construct related to global and less differentiated tendencies of pervasive feelings across time. In defining affect in this way, we are inherently defining affect as a *trait*. This approach is supported by theories about general affective temperament from Hippocrates (Eysenck, 1964). Overarching empirical support for affect has broadly been based on between-person factor analyses, suggesting that trait affect was primarily found to coalesce into two predominant constructs known as negative affect (i.e., neuroticism) and positive affect (i.e., extraversion) (Crawford & Henry, 2004; Crocker, 1997; Terracciano, McCrae, & Costa, 2003; Watson, Clark, & Tellegen, 1988b). Within the trait paradigm, positive affect is described by energetic and pleasant mood (happy, joy, excitement, etc.), and negative affect is described by aversive and unpleasant mood (Watson, 2005; Watson & Tellegen, 1985).

Subsequently, the Positive and Negative Affect Schedule (PANAS) was developed to measure positive and negative affect with a two-factor model (Watson, Clark, & Tellegen, 1988a) and broadly assess more high-activation feeling domains (Russell & Barrett, 1999). The bulk of support for this two-factor model comes from between-person studies of emotion and affect. Across 14 samples with different time frames, different respondents, and different rating methods (self or other ratings of affect), Watson (2005) reported that between-participant correlations for fear and sadness were strong in every sample, ranging from r =.50 to r =.69. In contrast, between-person correlations for fear and joviality ranged from r = -.26 to r = -.02. These findings supported the idea that these affective states represented the underlying constructs of negative affect and positive affect (Watson, 2005). Structures of positive affect and negative affect emerged across different mood descriptors and response formats and were robust to various potential methodological errors, accounting for 50 to 75% of common variance among affective terms (Watson, 1988b; Watson & Tellegen, 1985). The PANAS is now widely used among researchers studying emotion/affect or psychopathology in clinical, non-clinical, adult, and child samples (Crawford & Henry, 2004; Hughes & Kendall, 2009; Laurent et al., 1999). Thus, the PANAS has also achieved consistent support across many different cohorts.

Thus, we are proposing that emotions are distinct, fluctuating within-persons states and affect constitutes a between-person trait that is less differentiated. The aim of the current series of studies was to test whether an integrated model of emotion and affect that simultaneously accounted for within-person specific emotional states and broad affective differences between individuals provided a good fit to observed data.

Notably, although most studies have investigated positive and negative affect at the between-person level, six recent studies have investigated both the within-person and between-person organization of emotion and affect based on daily diary studies using multilevel factor models (Brose, Voelkle, Lövdén, Lindenberger, & Schmiedek, 2015; Charles, Mogle, Leger, & Almeida, 2017; Leonhardt, Konen, Dirk, & Schmiedek, 2016; Merz & Roesch, 2011; Möwisch, Schmiedek, Richter, & Brose, 2019; Rush & Hofer, 2014). Although most of these studies examined both state (i.e., within-person) and trait (i.e., between-person) models using the PANAS they had some salient limitations that constrained the ability to draw strong inferences.

Specifically, almost all prior investigations have yielded poor-fitting models using commonly accepted fit indices. Such fit indices were shown in a recent simulation study (Hsu, Kwok, Lin, & Acosta, 2015) to apply to solutions from within-person factor models (Hu & Bentler, 1998) and to perform well in identifying factor misspecification in multilevel factor models (Root Mean Square Error of Approximation (RMSEA) ≤ 0.06; Comparative Fit Index (CFI) ≥ 0.95; Tucker Lewis Index (TLI) ≥ 0.95; Standardized Root Mean Square Residual Within-Person ($SRMR_{within}$) ≤ 0.08, Standardized Root Mean Square Residual Between-Person ($SRMR_{between}$) ≤ 0.08) (Hsu et al., 2015). Additional simulation studies have found that models that only applied one and two factor solutions had unacceptable fit (Merz & Roesch, 2011; Rush & Hofer, 2014). Yet, only one of these studies to date also reported the fit indices which showed the greatest specificity to model misspecification of multilevel factor models (i.e., TLI) (Hsu et al., 2015). Likewise, even in a study that removed half of the negative affect items and examined a two-factor solution for within- and between-person models (Brose et al., 2015), model fit was unacceptable. Another study used only a small number of items (rather than 20 items) with no sub-domain overlap (i.e. no items that might be theorized to tap into the same emotional construct domains), which inherently limits the potential to find differentiation (Möwisch et al., 2019). Another study showed substandard fit indices based on the most discriminant fit index for multilevel factor models (Charles et al., 2017). Even in a study with six within-person factors and six-between person factors, fit remained unacceptable (Leonhardt et al., 2016). Thus, all available evidence to date investigating the fit of the within- and between-person structure of emotion and affect simultaneously has yielded poor-fitting models, has failed to report the fit index with the greatest sensitivity to model misspecification, and/or has lacked a sufficient number of sub-domains to be able to affectively capture potential granularity of within-person structures.

Limitations related to model fit notwithstanding, these studies have still substantially contributed to the understanding of state emotions and trait affect. Three studies have suggested that there were differences in the within- and between-person structures (Brose, Voelkle, Lövdén, Lindenberger, & Schmiedek, 2015; Charles, Mogle, Leger, & Almeida, 2017; Möwisch, Schmiedek, Richter, & Brose, 2019), with the results generally suggesting that there is greater differentiation between emotional states compared to affective traits. Nevertheless, three studies have also found that there are similar factor structures at both the within-person and between-person level (Leonhardt, Konen, Dirk, & Schmiedek, 2016; Merz & Roesch, 2011; Rush & Hofer, 2014). Consequently, more research is needed with revised methods to provide a greater understanding of the structure of emotion and affect.

In the current study, we investigated the within-person and between-person structure of emotion and affect using exploratory and confirmatory multilevel factor models of the PANAS across three separate samples. We used appropriate fit criteria based on a recent simulation work (Hsu et al., 2015) and comprehensively tested the number of within- and between-person factors. Based on the literature, we hypothesized that the within-person factor structure of the PANAS would result in a nine-factor solution as the PANAS was derived from nine subscales on the Mood Checklist (Zevon & Tellegen, 1982), and the between-person factor structure of the PANAS would result in a two-factor solution, based on the between-person trait research.

Method

Participants

Study 1. Participants (*N* = 176, 18% Male, 81% Female, 1% Transgender, M_{age} = 19.90, Age range 18-31, 66% White/Caucasian, 7% African American/Black, 7% Hispanic/Latino, 1% Arab/Middle Eastern/Arab American, 14% Asian/Asian-American, 2% Asian Indian, 1% Pacific Islander, 2% Multiple/Mixed Ethnicities, 1% Other) were recruited from undergraduate courses in the United States.

Study 2. Participants (*N* = 2,104, 15% Male, 85% Female, M_{age} = 28.21, Age range 13-72) were recruited from a general community sample using online recruitments in Germany as part of the Berlin Diary Study (Denissen & Kühnel, 2008).

Study 3. Participants (*N* = 245, 45% Male, 55% Female, M_{age} = 29.7, Age range 18-60, 75% White/Caucasian, 14% African American/Black, 3% Asian/Asian-American, 1% Asian Indian, 7% Multiple/Mixed Ethnicities) were recruited as part of a study (R01 MH056888) focusing on patients in treatment for psychopathology and their partners. A portion of these data have previously been used in Wright et al. (2017) and Lazarus et al. (2018).

Procedure

Study 1. Participants completed a daily diary with a subset of the emotion and affect items at the end of the day for a period of 50 days. At the end of each day, participants completed an online survey after having entered their unique participant ID number. Participants completed an average of 89.3% of the total surveys (mean = 44.7 surveys complete, median = 45 surveys, range 30 – 50 surveys).

Study 2. Participants were asked to complete emotion and affective measures once per day before going to bed for a period of 30 days. Participants completed an average of 44.5% of the total surveys (mean = 13.35 surveys complete, median = 11 surveys, range 1 – 28 surveys).

Study 3. Participants were asked to complete emotion and affective measures multiple times per day following social interactions for a period of 21 days (i.e. event-contingent). Participants completed an average of 5.145 surveys per day (mean = 122.23 surveys complete, median = 111 surveys, range 1 – 232 surveys).

Measures

Study 1. *Positive and Negative Affect Scales (PANAS).* The PANAS is a 20-item scale asking participants about an array of feelings (Watson et al., 1988a). The items on the PANAS scale are a subset of the Mood Checklist (Watson et al., 1988a), particularly items from the attentive ("attentive", "interested", "alert"), excited ("enthusiastic", "excited", "inspired"), proud ("proud", "determined"), strong ("strong", "active"), distressed ("distressed", "upset"), angry ("hostile", "irritable"), fearful ("scared", "afraid"), guilty ("guilty", "ashamed"), and jittery ("nervous", "jittery") subscales (Zevon & Tellegen, 1982). In the original scale construction, the authors of the PANAS selected these items on the basis that they represented purely positive or negative affect (based on their factor loadings) (Watson et al., 1988a) . For study 1, participants were asked to rate their experience of each emotion "today". Since items were repeated daily, the items were randomized to ensure that item order did not play a role. Participants rated each of the items on a 0 (Not at All) to 100 (Extremely) scale and responded to each item using a continuous slider. The retest reliabilities on the scale were r = 0.39-0.47 on the "today" validation of the PANAS (Watson et al., 1988a); notably, the lack of strong retest associations using the "daily" version of the scale is optimal, as the current study attempted to investigate both within-person and between-person variability. All items were assessed daily.

Study 2. *PANAS*. Participants in study 2 completed the German version of the PANAS at the end of each day. Participants were asked to rate each item for "today". The items were randomized to ensure that the item order did not play a role. Participants responded using a 1 (Not at all) to 5 (Extremely) Likert Scale. All items were assessed daily.

Study 3. *PANAS*. Participants in study 3 completed the PANAS when randomly prompted and following social interactions. Participants were asked to rate each item based on their momentary feelings. Participants responded using a 1 (Not at all) to 5 (Extremely) Likert Scale. All items were assessed at each survey.

Planned Analysis

Missing data were handled via full information maximum likelihood (Ji, Chow, Schermerhorn, Jacobson, & Cummings, 2018). The primary results were analyzed with multilevel factor models using MPlus version 8. First, the intraclass correlation coefficients were estimated using MPlus multilevel estimator. The intraclass correlation represents the total percentage of variation accounted for by individual differences (i.e., between-person variation) and ranges from 0 to 1. Intraclass correlation coefficients of 0.50 suggest that 50% of the variation is explained by between-person variation, and 50% of the variation in the sample is therefore within-person variation (Hsu, Lin, Kwok, Acosta, & Willson, 2016).

> Following this, the results were estimated using exploratory multilevel factor analyses. Based on the simulation study (Hsu et al., 2015), analyses proceeded in three primary steps: (1) exploratory factor analysis of the within-person factor structure alone within the first dataset, (2) exploratory factor analysis of the between-person factor structure alone within the first dataset, and (3) applying confirmatory multilevel factor analysis based on the within- and between-person structures identified in the first dataset to datasets 2 and 3. Note, as a contrast, we also ran confirmatory two-factor models at the within-person and between-person levels in both confirmatory models. All exploratory models were

rotated to the oblique Geomin criterion. Supported by strong performance in prior simulations, the cutoff for fit indices in other structural equation models (Hu & Bentler, 1998) perform well in identifying factor misspecification in multilevel factor models (RMSEA ≤ 0.06; CFI ≥ 0.95; TLI ≥ 0.95; $SRMR_{within} \leq 0.08$, $SRMR_{between} \leq 0.08$) (Hsu et al., 2015). This study was not preregistered. The data for study 2 is publicly available here: https://www.psychologie.hu-berlin.de/de/prof/perdev/downloadentwper/diarystudy.

Results

Intraclass correlations. See Figure 1 for a density plot describing the distribution of values for each variable in each study. Each of the intraclass correlation coefficients were estimated across all samples (see Table 1), and the results suggested that all items showed substantial amounts of both between-person variation (sample 1: 37% on average, range = 26-51%; sample 2: 40% on average, range 29-55%; sample 3: 35% on average, range 19-50%) and within-person variation (sample 1: 63% on average, range 49-74%; sample 2: 60% on average, range 45-71%; sample 3: 65% on average, range 50-81%). These estimates suggested that there was sufficient within-person and between-person variation to estimate both within-person and between-person factor models for all samples (Hsu et al., 2016).

Within-Person Exploratory Factor Analysis. The within-person exploratory factor models suggested that the seven-factor model provided adequate fit within the first sample (see Table 2). See Table 3 for a depiction of all loadings and factor correlations.

Between-Person Exploratory Factor Analysis. The between-person exploratory factor models suggested adequate fit with the two-factor model (see Table 2). The results of the two-factor model are presented in Table 3.

Confirmatory Multilevel Factor Models in Samples 2 and 3. The confirmatory multilevel models with two within-person factors and two between-person factors resulted in poor fit to the data. In contrast, the confirmatory multilevel model with seven within-person factors and two between-person factors suggested an excellent fit to the data for both samples 2 and 3 (see Table 2). See Table 4 and Table 5 for a depiction of the factor loadings and factor correlations. In sum, all results suggested that a model with seven within-person factors and two between-person factors fit the data well.

Discussion

Overall, based on three separate samples (including a student sample from the United States, a community sample from Germany, and a clinical sample from the United States), the results suggested that the within-person structure of emotion was broadly marked by emotional specificity in day-to-day life. This is particularly notable as the analyses were conducted using a measure originally designed to represent affective generality. Nevertheless, these results also support trait models of emotional generality, suggesting that, when comparing across persons, levels of negative affect tend to be higher or lower in the same persons, and levels of positive affect tend to be higher or lower in the same persons. Thus, these findings provide compelling evidence to integrate seemingly competing models of emotions and affect.

These findings support prior studies' findings, that provided evidence of discrete within-person emotional states (Ekman et al., 1983; Künecke et al., 2014; Lench et al., 2011; Levenson et al., 1990; Rainville et al., 2006; Trampe et al., 2015; Vansteelandt et al., 2005; Zelenski & Larsen, 2000). In particular, the anger, sad, and anxiety factors support the external validity of the distinctiveness of anger, anxiety, and sadness identified as distinct emotions within experimental studies of emotional elicitation (Lench et al., 2011).

Notably, the observed pattern of factors and factor loadings of within-person states was close to conceptualizations of emotional structure proposed previously (Zevon & Tellegen, 1982). However, the strong and proud factors hypothesized by prior scales were found to be part of the same factor here (Zevon & Tellegen, 1982). Likewise, the scared and anxious scales were found to be part of the same factor. Otherwise, the upset-distressed factor, enthusiasm, anger, sad, and attentive factors closely resembled the previously theorized structure of these within-person emotional items.

Furthermore, these results corroborate the findings that negative and positive affect appear to best reflect variation across persons supporting a large range of between-person research (Crawford & Henry, 2004; Crocker, 1997; Terracciano et al., 2003; Watson, 2005; Watson & Tellegen, 1985; Watson et al., 1988b). Taken together, these findings suggest that the constructs of positive and negative affect are valid concepts when applied *across,* but not within persons.

Additionally, although conceptions of positive and negative affect are increasingly used to study within-person variability in emotional states (Hopko, Armento, Cantu, Chambers, & Lejuez, 2003; Jose, Lim, & Bryant, 2012; Shahar & Herr, 2011; White, Horwath, & Conner, 2013), these models suggest that positive and negative affect may not be sufficiently well calibrated to capture the variety of emotional states (which is similar to the conclusions reached by Brose et al., 2015). Nevertheless, these models could be coaxed to exhibit good model fit if there are fewer indicators. Consequently, depth of measurement is important in establishing within-person level factors. Indeed these results may have implications for treatment models that attempt to treat the construct of negative affect by design (Carl, Gallagher, Sauer-Zavala, Bentley, & Barlow, 2014). These results suggest that the construct of negative affect is not a within-person construct. The findings of the current investigation thus suggest that these treatments may be addressing four separable symptom dimensions across treatment, rather than one "underlying" symptom dimension (Barlow, Ellard, Sauer-Zavala, Bullis, & Carl, 2014).

In addition to the many strengths of the study, the study has several limitations. Although these findings suggest that there are several discrete emotions experienced within-persons, it does underscore the dynamics that might occur between these different emotional states. For example, anxiety and depression have been shown to influence one another, particularly over short-time periods (Jacobson, Lord, & Newman, 2017; Jacobson & Newman, 2017; Jacobson & Newman, 2016; Jacobson & Newman, 2014). Other work has also proposed that some of these factors may be linked over time, such as the role of anxiety leading to attentiveness and enthusiasm leading to attentiveness (Marcus & Mackuen, 1993). Consequently, future work should examine the role of these discrete emotional dynamics as they may influence one another over time and explain the co-occurrence of higher levels of anxiety, fear, anger, depression, and distress within the same persons. Another limitation of the current study is the use of the PANAS, which does not measure low activation of positive and negative affective states, and, thus, the degree to which low activation affective states might impact within- and between-person level information is unknown. Additionally, the current work found a heavy concentration of low values in the data distribution. Although these could be regarded as a fundamental aspect of the processes being observed, these could also point towards potential floor effects. Notwithstanding these limitations, the current manuscript provides substantial support for the structural validity of discriminant emotional states and broad affective traits.

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Table 1

Intraclass Correlation Coefficients Across the Three Samples

Item	Sample 1	Sample 2	Sample 3
Interested	0.38	0.35	0.34
Distressed	0.33	0.40	0.30
Excited	0.33	0.35	0.37
Upset	0.26	0.30	0.19
Strong	0.51	0.43	0.50
Guilty	0.33	0.51	0.34
Scared	0.34	0.55	0.26
Hostile	0.31	0.42	0.30
Enthusiastic	0.37	0.33	0.38
Proud	0.41	0.43	0.45
Irritable	0.28	0.36	0.25
Alert	0.46	0.37	0.41
Ashamed	0.34	0.52	0.31
Inspired	0.42	0.35	0.42
Nervous	0.36	0.44	0.37
Determined	0.40	0.38	0.41
Attentive	0.45	0.36	0.35
Jittery	0.43	0.42	0.46
Active	0.39	0.29	0.37
Afraid	0.35	0.51	0.27

Note. The current table presents the intraclass correlation coefficients (ICCs) across each item within the Positive and Negative Affect Schedule. The results suggested that all items showed substantial amounts of both between-person and within-person variation.

Table 2

All Model Fit Indices for Exploratory and Confirmatory Models Across All Samples

Sample	Type	# Within Factors	# Between Factors	RMSEA	CFI	TLI	SRMR within	SRMR between
1	EFA-Within	1	0	0.087	0.579	0.060	0.132	
1	EFA-Within	2	0	**0.052**	0.857	0.641	**0.049**	
1	EFA-Within	3	0	**0.041**	0.913	0.753	**0.036**	
1	EFA-Within	4	0	**0.033**	0.945	0.820	**0.027**	
1	EFA-Within	5	0	**0.023**	**0.972**	0.894	**0.019**	
1	EFA-Within	6	0	**0.017**	**0.984**	0.929	**0.013**	
1	EFA-Within	7	0	**0.010**	**0.992**	**0.958**	**0.010**	
	EFA-Between	0	1	0.026	0.960	0.911		0.292
	EFA-Between	0	2	**0.015**	**0.984**	**0.960**		**0.061**
2	CFA	7	2	**0.037**	**0.962**	**0.953**	**0.032**	**0.070**
2	CFA	2	2	0.075	0.829	0.806	**0.078**	**0.070**
3	CFA	7	2	**0.013**	**0.967**	**0.959**	**0.020**	**0.078**
3	CFA	2	2	**0.031**	0.800	0.774	0.058	0.062

Note. The current table depicts the fit indices from the exploratory multilevel factor analysis at both within- and between-person variation in the first sample (*N* = 176 undergraduates in a 50 day daily diary study in the Unites States), and the fit of confirmatory multilevel factor models within the second (*N* = 2,104 in a 30 day daily diary study from a community sample in Germany) and third samples (*N* = 245, ecological momentary assessment study from an outpatient psychiatry clinic within the United States completing five measurements per day for 21 days). The model results suggested that 7 within-person factors and 2 between-person factors fit the data well for all samples, and that 2 within-person and 2 between-person factors provided poor fit to the data in all samples.

Table 3

Sample 1 Exploratory Within- and Between-Person Factor Loadings and Factor Correlations

	Within							Between	
Item	F1	F2	F3	F4	F5	F6	F7	F1	F2
Distressed	**0.93***	0.00	0.00	0.00	0.00	0.01	-0.01	-0.05	**0.79***
Upset	**0.24***	-0.09*	-0.04	0.09*	**0.30***	**0.20***	0.00	-0.09	**0.85***
Excited	-0.01	**0.80***	-0.02	-0.01	-0.01	0.01	-0.02*	**0.89***	0.03
Enthusiastic	-0.01	**0.78***	0.03	0.00	0.00	-0.02	0.01	**0.91***	-0.02
Interested	-0.01	**0.45***	0.10*	-0.05*	0.01	-0.01	**0.22***	**0.94***	-0.05
Inspired	-0.01	**0.26***	**0.40***	0.00	-0.02	0.03	0.03	**0.89***	0.10*
Strong	-0.02*	-0.04*	**0.70***	-0.02	0.02*	-0.01	0.03	**0.84***	-0.05
Proud	-0.01	**0.13***	**0.58***	0.03*	-0.03*	-0.08*	-0.06*	**0.84***	-0.01
Determined	0.03*	-0.01	**0.44***	0.05*	-0.05*	-0.02	**0.25***	**0.88***	0.08
Active	0.03*	0.10*	**0.40***	-0.07*	-0.02	0.04*	**0.19***	**0.80***	-0.16*
Scared	-0.02*	-0.01	0.03*	**0.81***	0.00	0.02	-0.03*	0.02	**0.98***
Afraid	-0.01	-0.01	0.01	**0.80***	0.00	0.03*	-0.02*	0.00	**0.97***
Nervous	**0.18***	0.01	-0.08*	**0.53***	0.00	-0.04*	**0.12***	0.02	**0.87***
Jittery	0.04	0.07*	-0.08*	**0.37***	0.12*	-0.04*	**0.17***	0.18*	**0.67***
Irritable	0.03	-0.02	-0.02	-0.01	**0.77***	-0.04*	-0.01	0.04	**0.53***
Hostile	-0.05*	0.03	0.04*	0.02	**0.69***	0.04*	0.00	0.12	**0.51***
Ashamed	0.01	-0.01	0.01	-0.01	-0.01	**0.80***	0.00	-0.09	**0.83***
Guilty	0.00	0.03*	-0.03	0.04	0.01	**0.67***	-0.01	**-0.11***	**0.78***
Attentive	-0.02*	0.01	0.05*	-0.04*	-0.02*	-0.01	**0.70***	**0.84***	0.01
Alert	-0.03*	0.04*	0.00	0.05*	0.01	0.00	**0.63***	**0.80***	0.04
F1	1.00							1.00	
F2	-0.33*	1.00						0.01	1.00
F3	-0.24*	0.71*	1.00						
F4	0.56*	-0.20*	-0.13*	1.00					
F5	0.49*	-0.28*	-0.20*	0.33*	1.00				
F6	0.46*	-0.26*	-0.26*	0.54*	0.34*	1.00			
F7	-0.06*	0.51*	0.63*	0.04*	-0.09*	-0.13*	1.00		

Note. * $p < .050$. The current table depicts the fit indices from the exploratory multilevel factor analysis at both within- and between-person variation in the first sample ($N = 176$ undergraduates in a 50 day daily diary study in the Unites States). We label the corresponding factors with the following labels: Within-person factors: F1 = Distressed, F2 = Excitement/Enthusiastic, F3 = Strong/Proud, F4 Anxiety, F5 = Anger, F6 = Sad, F7 = Attentive. Factor loadings with an absolute value greater than 0.1 bolded. Between-person factors: F1 = Positive affect, F2 = Negative affect.

Table 4
Sample 2 Confirmatory Within- and Between-Person Factor Loadings and Factor Correlations

	Within							Between	
Item	F1	F2	F3	F4	F5	F6	F7	F1	F2
Distressed	**0.95***	--	--	--	--	--	--	--	**0.91***
Upset	-0.04*	--	--	--	**0.81***	0.05*	--	--	**0.83***
Excited	--	**0.57***	--	--	--	--	--	**0.71***	--
Enthusiastic	--	**0.79***	--	--	--	--	--	**0.85***	--
Interested	--	**0.46***	-0.03*	--	--	--	--	**0.90***	--
Inspired	--	**0.77***	-0.08*	--	--	--	**0.33***	**0.75***	--
Strong	--	--	**0.85***	--	--	--	--	**0.87***	--
Proud	--	**0.27***	**0.46***	--	--	--	--	**0.71***	--
Determined	--	--	**0.29***	--	--	--	**0.39***	**0.90***	--
Active	--	--	**0.14***	--	--	--	**0.59***	**0.85***	-0.07*
Scared	--	--	--	**0.84***	--	--	--	--	**0.90***
Afraid	--	--	--	**0.79***	--	--	--	--	**0.90***
Nervous	-0.05*	--	--	**0.81***	--	--	0.18*	--	**0.86***
Jittery	--	--	--	**0.66***	**0.14***	--	0.09*	--	**0.86***
Irritable	--	--	--	--	**0.81***	--	--	--	**0.79***
Hostile	--	--	--	--	**0.78***	--	--	--	**0.79***
Ashamed	--	--	--	--	--	**0.74***	--	--	**0.86***
Guilty	--	--	--	--	--	**0.80***	--	--	**0.82***
Attentive	--	--	--	--	--	--	**0.74***	**0.90***	--
Alert	--	--	--	--	--	--	**0.62***	**0.78***	--
F1	1.00							1.00	
F2	-0.51*	1.00						-0.08	1.00
F3	-0.56*	0.76*	1.00						
F4	0.70*	-0.31*	-0.41*	1.00					
F5	0.58*	-0.34*	-0.31*	0.53*	1.00				
F6	0.64*	-0.32*	-0.43*	0.65*	0.54*	1.00			
F7	-0.43*	0.89*	0.76*	-0.27*	-0.23*	-0.28*	1.00		

Note. * $p < .050$. -- denotes coefficient fixed to 0. The current table displays the results of the fit of confirmatory multilevel factor models within the second sample (N = 2,104 in a 30 day daily diary study from a community sample in Germany). As before, we describe the factors as follows: Within-person factors: F1 = Distressed, F2 = Excitement/Enthusiastic, F3 = Strong/Proud, F4 Anxiety, F5 = Anger, F6 = Sad, F7 = Attentive. Factor loadings with an absolute value greater than 0.1 bolded. Between-person factors: F1 = Positive affect, F2 = Negative affect.

Table 5

Sample 3 Confirmatory Within- and Between-Person Factor Loadings and Factor Correlations

	Within							Between	
Item	F1	F2	F3	F4	F5	F6	F7	F1	F2
Distressed	**0.77***	--	--	--	--	--	--	--	**0.740***
Upset	**0.40***	--	--	--	**0.40***	0.05	--	--	**0.819***
Excited	--	**0.76***	--	--	--	--	--	**0.90***	--
Enthusiastic	--	**0.78***	--	--	--	--	--	**0.90***	--
Interested	--	**0.43***	-0.06*	--	--	--	--	**0.89***	--
Inspired	--	**0.43***	**0.31***	--	--	--	**0.407***	**0.94***	--
Strong	--	--	**0.72***	--	--	--	--	**0.84***	--
Proud	--	**0.26***	**0.46***	--	--	--	--	**0.87***	--
Determined	--	--	**0.38***	--	--	--	**0.306***	**0.93***	--
Active	--	--	**0.28***	--	--	--	**0.443***	**0.81***	-0.00
Scared	--	--	--	**0.75***	--	--	--	--	**0.99***
Afraid	--	--	--	**0.74***	--	--	--	--	**1.00***
Nervous	**0.21***	--	--	**0.40***	--	--	0.076*	--	**0.71***
Jittery	--	--	--	**0.35***	**0.17***	--	0.061*	--	**0.69***
Irritable	--	--	--	--	**0.75***	--	--	--	**0.63***
Hostile	--	--	--	--	**0.60***	--	--	--	**0.67***
Ashamed	--	--	--	--	--	**0.71***	--	--	**0.88***
Guilty	--	--	--	--	--	**0.67***	--	--	**0.79***
Attentive	--	--	--	--	--	--	**0.75***	**0.77***	--
Alert	--	--	--	--	--	--	**0.69***	**0.68***	--
F1	1.00							1.00	
F2	-0.26*	1.00						0.18*	1.00
F3	-0.11*	0.73*	1.00						
F4	0.63*	-0.08*	-0.02	1.00					
F5	0.78*	-0.27*	-0.09*	0.40*	1.00				
F6	0.60*	-0.12*	-0.07	0.60*	0.42*	1.00			
F7	0.00	0.72*	0.66*	0.05	-0.02	-0.01	1.00		

Note. * $p < .050$. -- denotes coefficient fixed to 0. The current table displays the results of the fit of confirmatory multilevel factor models within the third sample (N = 245, ecological momentary assessment study from an outpatient psychiatry clinic in the United States completed five measurements per day for 21 days). As before, we describe the factors as follows: Within-person factors: F1 = Distressed, F2 = Excitement/Enthusiastic, F3 = Strong/Proud, F4 Anxiety, F5 = Anger, F6 = Sad, F7 = Attentive. Factor loadings with an absolute value greater than 0.1 bolded. Between-person factors: F1 = Positive affect, F2 = Negative affect.

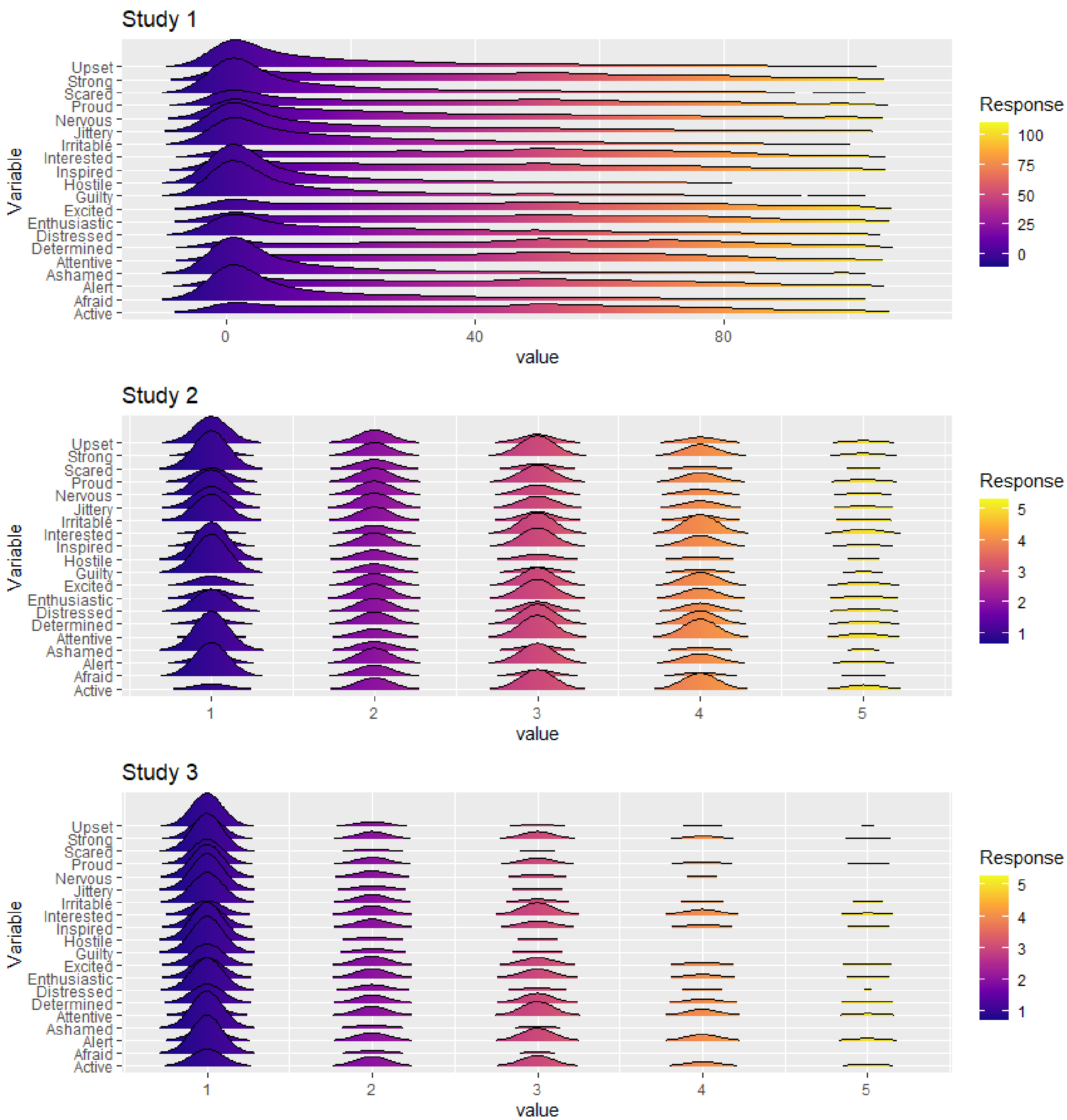

Figure 1. Density plots describing the distributions of each variable across the three studies.