

Psychological Assessment

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Online First Publication, July 22, 2021. <http://dx.doi.org/10.1037/pas0001052>

CITATION

Stanton, K., Brown, M. F. D., McDanal, R., Carlton, C. N., & Emery, N. N. (2021, July 22). Informing the Classification and Assessment of Positive Emotional Experiences: A Multisample Examination of Hierarchical Positive Emotionality Models. *Psychological Assessment*. Advance online publication. <http://dx.doi.org/10.1037/pas0001052>

Informing the Classification and Assessment of Positive Emotional Experiences: A Multisample Examination of Hierarchical Positive Emotionality Models

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Despite being multifaceted in nature, positive emotional (PE) experiences often are studied using only global PE ratings, and measures assessing more specific PE facets do not converge in their assessment approaches. To address these issues, we examined hierarchical factor structures of ratings of positive emotionality, which reflect propensities toward experiencing PE, in both online community adult ($N = 375$) and undergraduate ($N = 447$) samples. Preregistered analyses indicated (a) a broad distinction between tendencies to experience social affection and other PE types, and that (b) PE ratings can be differentiated by as many as four replicable factors of *Joviality*, *Social Affection*, *Serenity*, and *Attentiveness*. These PE dimensions were associated with distinct personality and psychopathology profiles. Examples of these distinctive associations included Joviality displaying robust positive associations with grandiosity and exhibitionism; conversely, although Social Affection and Joviality were strongly correlated, Social Affection showed associations in the opposite direction with grandiosity and exhibitionism. Other notable results include Serenity (e.g., feeling relaxed) showing negative associations with negative emotionality at a magnitude indicating that Serenity may reflect low levels of negative emotionality to a considerable degree. Collectively, these results highlight the need to consider distinct PE facets in addition to global PE ratings when assessing PE, as important nuance may be lost otherwise. Furthermore, our results indicate the need for additional research clarifying PE structure at different levels of abstraction to inform future measure development efforts and assessment approaches.

Public Significance Statement

Our results inform how tendencies toward having different types of positive emotional experiences such as feeling energetic, compassionate, and determined are interrelated. These results can be used to guide comprehensive assessment of emotional experiences in future research studies, particularly in research focused on how different emotional experiences are linked to personality and mental health symptoms.

Keywords: positive emotionality, positive emotion, hierarchical factor structures, exploratory factor analysis, preregistration

Supplemental materials: <https://doi.org/10.1037/pas0001052.supp>

Positive emotional (PE) experiences have been studied widely in connection to psychopathology, well-being, and personality over the last several decades (Gruber, 2011; Watson, Stasik, Ellickson-Larew, et al., 2015). As the body of research on PE experiences has expanded, so have definitions of the PE domain. Traditionally, PE research has

focused on experiences such as joy and excitement that are linked to individual differences in extraversion (Cowen et al., 2019; Shiota et al., 2006; Watson, Stasik, Chmielewski, et al., 2015). However, conceptualizations of the PE domain now also include a broader range of experiences that are associated most strongly with five-factor model

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Note that the ideas appearing in this manuscript have not been disseminated previously. Research ethics committee approval was obtained for this research, and all individual research participants provided informed consent for their participation. Ethics approval was not explicitly sought to post data presented in this manuscript to open access, online repositories, and thus,

these data are not provided on such a forum. However, contact Kasey Stanton should you have any questions or wish to access these data. There is no funding to report for this research.

Information regarding preregistered analyses for this study and manuscript preprints can be found here on the Open Science Framework platform: <https://osf.io/u8apz>.

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(FFM) traits other than extraversion. Examples of this include PE experiences of compassion that are most strongly associated with agreeableness of any FFM trait, as well as feelings of determination and attentiveness aligning with FFM conscientiousness (Fredrickson, 2013; Shiota et al., 2006; Watson & Clark, 1999). Upon careful consideration, some PE dimensions may represent a blend of affective, cognitive, and behavioral components rather than being purely emotional in nature. For example, a term such as “attentiveness” may bring to mind aspects of thought or behavior rather than or in addition to affect (e.g., thinking that a conversation is interesting and then displaying interest/attentiveness with specific behaviors). However, attentiveness (e.g., being attentive, interested) is described as a PE facet dimension in some models because such a term may reflect positively valenced feeling states of curiosity or motivation (Fredrickson, 2013; Watson & Clark, 1999). Supporting this, experiences of attentiveness frequently co-occur with other PE experiences, and attentiveness ratings load strongly onto a general latent factor with ratings of joy and excitement that have long been deemed central to PE descriptions as reviewed.

Although PE can be assessed across different temporal time-frames, the present study focuses on improving the classification and assessment of dispositional, trait tendencies toward experiencing PE. Shorter term, state assessments of PE experiences often are described using terminology such as “positive emotion” or “positive affect.” Dispositional tendencies often are referred to as “positive emotionality” or “positive affectivity” (Shiota et al., 2006; Watson & Clark, 1999), which we emphasize here given that many multi-dimensional measures have become widely used in PE research. Table 1 provides an overview of these measures, and scales from specific measures are organized rationally into clusters representing facets of the broader PE domain in this table. These measures include the Dispositional Positive Emotion Scales (DPES; Shiota et al., 2006), the Positive and Negative Affect Schedule-Expanded Form (PANAS-X; Watson & Clark, 1999), and the modified Differential Emotions Scale (mDES; Fredrickson et al., 2003), among other commonly used measures [e.g., the Gratitude Adjective Checklist (McCullough et al., 2002); the Multiple Affect Adjective Check List-Revised (MAACL-R; Lubin & Zuckerman, 1999); the Multidimensional Mood-State Inventory (MMSI; Boyle et al., 2015); the Temperament and Affectivity Inventory (TAI; Watson, Stasik, Chmielewski, et al., 2015)]. The list of scales shown in Table 1 is not exhaustive, but it illustrates that these scales collectively assess a wide range of dimensions, including dimensions linked most strongly to FFM traits other than extraversion (e.g., at least six existing scales include item content assessing attentiveness, which may be more strongly linked to conscientiousness than extraversion).

Issues Resulting From Nonspecific and Inconsistent Assessment Approaches

Although most measures shown in Table 1 assesses multiple dimensions, researchers often aggregate PE ratings into composite scores when using brief measures such as the mDES and the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988); unlike Watson and Clark (1999) more recently developed PANAS-X, the PANAS does not provide the assessment of facet dimensions. Although these assessment approaches are efficient (e.g., the PANAS

Table 1
Positive Emotionality Content Coverage of Existing Measures

Positive emotionality facet	Example scales
Joviality	PANAS-X Joviality, DPES Joy, mDES Amusement, mDES Joy, DPES Amusement, MAACL-R Positive Affect, TAI Geniality
Energy/vigor	PANAS-X Joviality, MAACL-R Sensation Seeking, TAI Vigor
Self-assurance/boldness	PANAS-X Self-Assurance, DPES Pride, mDES Pride, MAACL-R Sensation Seeking, TAI Experience Seeking
Attentiveness	PANAS-X Attentiveness, mDES Interest, mDES Inspiration, MAACL-R Concentration, MMSI Arousal-Alertness, TAI Attentiveness
Serenity	PANAS-X Serenity, DPES Contentment, mDES Serenity
Gratitude	mDES Gratitude, DPES Contentment, Gratitude Adjective Checklist
Social affection/compassion	DPES Love, DPES Compassion, mDES Love, MAACL-R Social Affection, TAI Geniality
Awe	DPES Awe, mDES Awe, MMSI Curiosity

Note. Not every scale from each measure listed is shown above (e.g., the mDES includes adjectives assessing hope that were not clearly represented in most other measures). Some scales with different labels are listed together because they include at least some content relevant to the predicted positive emotionality facet (e.g., various amusement scales include content related to cheerfulness). Additionally, some scales are listed twice because they include content potentially relevant to multiple facets (e.g., PANAS-X Joviality includes adjectives such as *cheerful* but also adjectives such as *energetic*). DPES = Dispositional Positive Emotion Scales; MAACL-R = Multiple Affect Adjective Check List-Revised; MAACL = Mood Adjective Checklist; mDES = Modified Differential Emotions Scale; MMSI = Multidimensional Mood-State Inventory; PANAS-X = Positive and Negative Affect Schedule-Expanded Form. TAI = Temperament and Affectivity Inventory.

assesses general PE with 10 items), they do not allow distinctive associations for different PE facet dimensions to be identified.

Examples of distinctive PE facet associations that would be masked by focusing analyses solely on global PE composite ratings include those for PE facets with different FFM traits. As discussed, extraversion and high-arousal PE experiences are linked closely (Boyle et al., 2015; Heuchert & McNair, 2012; Watson, Stasik, Chmielewski, et al., 2015). Indeed, factor analytic research indicates that a specific PE factor representing individual differences in cheerfulness and energy is a core facet of the extraversion domain (Watson, Stasik, Ellickson-Larew, et al., 2015). Watson, Stasik, Ellickson-Larew, et al. (2015) also identified an extraversion facet labeled excitement seeking in their analyses of extraversion structure, which has clear parallels with some PE facet scales shown in Table 1 (e.g., MAACL-R Sensation Seeking). However, other PE facet scales assessing compassion correlate more strongly with agreeableness than with extraversion (Shiota et al., 2006), which is not surprising because agreeableness measures also assess tendencies toward being kind and sympathetic. These specific PE experiences that are linked to agreeableness may serve a different function than other types of PE by helping to maintain social bonds (Fredrickson, 2013; Robinson, 2007). As another example of PE facet level distinctiveness, scales assessing serenity, which also are used widely in PE research (e.g., Tsai, 2017), show strong negative

associations with measures of negative emotionality (NE; Payne & Schnapp, 2014; Watson & Clark, 1999). Thus, serenity may be less distinct from NE than other PE facets and may represent a blend of low NE and high levels of low-arousal PE.

In addition to distinctive PE facet associations being obscured by focusing analyses only on PE composite ratings, a careful review of Table 1 indicates that different measures vary in the specific PE dimensions they assess. Thus, even if researchers assess PE at the facet level, study results could vary depending on the measure used. For example, use of the DPES (Shiota et al., 2006) provides the assessment of seven different facet dimensions, several of which are interpersonally oriented (e.g., Love and Compassion). However, other measures shown in Table 1 do not assess these dimensions (e.g., the MAACL-R; PANAS-X), which may be important to consider in research focused on social relationships for example. This lack of coherence represents a longstanding issue leading to inconsistencies in measurement approaches, which may hinder PE research across contexts (e.g., scores on some PE facet measures may change more than others with treatment; Cowen et al., 2019; Stanton & Watson, 2015).

Present Study Goals: Informing Positive Emotionality Assessment

To inform how PE can be classified and assessed comprehensively and consistently across studies, we aimed to identify a replicable factor analytic model of PE. Specifically, we examined hierarchical factor structures of PE across two samples (i.e., 447 undergraduates; 375 community adults). We examined these hierarchical structures using exploratory factor analysis (EFA) due to a lack of clarity regarding how PE ratings should be organized at various levels of abstraction. As noted, we focused here on assessing emotionality, or dispositions toward experiencing PE. We recognize the importance of examining the consistency of PE factor structures across different temporal frames (e.g., when also assessing state experiences), but examining factor structures across multiple samples and administration instructions was beyond our study scope.

Existing PE research aimed at informing measure development and assessment often has focused on a single level of specificity (e.g., identifying how many PE facets should be assessed with a specific measure), and existing measures vary in their content and format. Some research has directly examined the factor structure of PE experiences outside of the context of measure development (e.g., Stanton & Watson, 2015), but included limited or no coverage of PE variants such as compassion and awe. Thus, the present study extends prior work by informing our understanding of the classification of a wide range of PE experiences at broad (i.e., a general PE factor), intermediary (e.g., differentiating high- and low-arousal PE), and specific levels (e.g., distinguishing more specific, interpersonally oriented PEs such as compassion and gratitude). As a related secondary aim, we examined associations for both general and specific PE dimensions identified in our EFAs to demonstrate that specific PE facets show distinctive associations that are masked by focusing analyses solely on composite PE ratings.

Study Predictions

Timestamped predictions were made prior to conducting analyses, as described on the first author's Open Science Framework page

(see <https://osf.io/u8apz>) and in online Supplemental Appendix 1. These predictions were made after data collection already had been completed (timestamped date of April 22, 2020), such that these registered analyses represent a "postregistration" (Benning et al., 2019). As outlined in Table 1, we predicted that we would be able to identify as many as eight replicable factors representing different PE facets (also see online Supplemental Table S1 and <https://osf.io/u8apz> for a summary of these same predictions made for our preregistered analyses). Each predicted PE facet appeared to be reflected in the content of several or more existing scales (e.g., the DPES, PANAS-X); in most cases, five or more existing scales assess content relevant to each predicted facet (e.g., five scales include content relevant to social affection/compassion; again, see Table 1).

Prior research indicates that some types of PE experiences may be challenging to differentiate (e.g., feelings of joy and energy; Fredrickson, 2013), and our analyses involved factor analyzing scores from many items across samples. Therefore, we realized that it may not be possible to identify as many as eight well defined, replicable factors. We generally had more confidence in our predictions for factor solutions with relatively few factors and less confidence in our predictions for factor solutions with larger numbers of factors representing nuanced PE differentiations. As shown in online Supplemental Figure S1, we predicted that we would be able to identify at least five factors of Joviality, Self-Assurance (e.g., feeling bold), Attentiveness, Serenity, and Social Affection given that many of these distinctions are made in existing multifaceted measures (e.g., the DPES, PANAS-X, and TAI).

Finally, predicted associations for these five PE factors with symptom and personality ratings are shown in online Supplemental Table S2, which also was included in our data analytic preregistration document (<https://osf.io/u8apz>). We predicted that Joviality and Self-Assurance would associate strongly with extraversion, Attentiveness with conscientiousness, and Social Affection with agreeableness (all predicted $r_s = .50$). We also hypothesized that Serenity would associate strongly and negatively with NE based on prior research (Payne & Schnapp, 2014; Stanton et al., 2016). These predictions for PE facet associations with FFM traits were made based on the literature reviewed (e.g., Shiota et al., 2006; Watson et al., 2000) as well as alignment between the content of specific PE facet measures and FFM traits (e.g., Social Affection and agreeableness measures both reflect tendencies toward being compassionate). Consequently, given these aspects of alignment across PE and FFM measures, demonstrating these patterns of associations would not be surprising; however, examining them enabled us to contextualize our factor analytic findings by showing that distinct PE facets represent meaningfully different trait tendencies. Finally, we predicted that most PE facets would associate negatively with personality pathology and internalizing symptoms, but that PE ratings of boldness subsumed within Self-Assurance would show positive associations with some aspects of personality pathology (e.g., attention seeking) and some symptoms (e.g., euphoric mood).

Method

Description of Undergraduate and Online Community Samples

As discussed, we recruited both community adult and undergraduate participants (see online Appendix S1 and <https://osf.io/u8apz>,

for the description of issues related to validity checks and missing data). Institutional research ethics board approval was granted for all data collection and research procedures. Undergraduates ($N = 447$) were recruited through the psychology department participant pool at a Canadian university. Average participant age was 18.6 years ($SD = 1.6$), and most participants identified as cisgender women ($n = 303$; 67.8%). Demographic information was collected in a manner consistent with university ethics board guidelines, with 40.9% of participants identifying as being of White or European descent (e.g., Western European descent); 28.2% as of East Asian descent (e.g., Chinese descent); 16.6% as of South Asian descent (e.g., Indian descent); and 4.5% as of Middle Eastern or North African descent; remaining participants (9.8%) specified other identities.

Community adults ($N = 375$) were recruited using Amazon Mechanical Turk. Average participant age was 39.1 years ($SD = 12.1$), with a slight majority of participants identifying as cisgender men ($n = 201$; 53.6%). Most participants identified as White or European American (73.3%), 10.1% as Black or African American, and 8.0% as Asian American, with the remaining percentage of the sample endorsing other identities. In regard to the highest level of education obtained, 41.6% of the sample reported having a bachelor's degree; 32.3% reported having a vocational degree, an associate's degree, or some college; 15.2% reported having a high school diploma or less education, and 10.9% reported having a master's degree or higher.

Positive and Negative Emotionality Assessment

Positive Emotionality

To assess PE, participants were asked to indicate "to what extent you generally feel this way" when rating different emotion adjectives using a 5-point rating scale ranging from 1 (*very slightly or not at all*) to 5 (*extremely*). These instructions and rating scale follow the format of the PANAS-X (Watson & Clark, 1999), which we used here because (a) many of the adjectives used were drawn from the PANAS-X and (b) this format has been widely used in prior research. Specifically, we administered all PE adjectives from the three PANAS-X PE scales: Joviality (8 items; e.g., *cheerful*), Self-Assurance (6 items; e.g., *proud*), and Attentiveness (4 items; e.g., *determined*). The PANAS-X also includes a Serenity scale that is described as assessing a blend of low NE and low-arousal PE. Due to reflecting elements of both PE and NE, the Serenity scale is not identified as a clear PE measure in the PANAS-X manual (Watson & Clark, 1999); however, we also included adjectives from the Serenity scale (e.g., *relaxed*) in our analyses because this item content is included in many other PE measures. Additionally, we included other adjectives not included in the PANAS-X reflecting PE experiences such as love and compassion, which are constructs assessed by other measures such as the Mood Adjective Checklist (MACL; Nowlis, 1965). Like the PANAS-X, the MACL uses adjective-based assessment, and MACL adjectives from the MACL Social Affection scale (e.g., *affectionate*, *warmhearted*) also were included here. Furthermore, as reviewed, some measures (e.g., the mDES, MACL, DPES) include assessment of PE experiences such as liveliness, gratitude, and awe that we were unable to sufficiently assess using only the PANAS-X and MACL adjectives. Consequently, we administered additional adjectives to assess each of these domains (e.g., adding adjectives such as feeling *thankful* to

assess gratitude), which were generated by the first and second study authors based on the review of the content of measures shown in Table 1. As shown in Table 2, we used a total of 48 different adjectives to assess PE experiences, which included at least several adjective ratings anticipated to load on each potential factor.

We also considered alternative assessment approaches (e.g., administering both the DPES and PANAS-X items). However, alternative approaches such as jointly factor analyzing items/scales from different measures shown in Table 1 may have been challenging. For example, the PANAS-X uses adjectives whereas the DPES items are written in sentence form, such that items may have loaded onto factors together based on having a shared administration format rather than on content grounds (see Watson, Stasik, Chmielewski, et al., 2015).

Finally, participants from both samples also were administered the 10 adjectives from the general Negative Affect (NA) scale of the PANAS-X. Participants again were asked to indicate to "what extent you generally feel this way" when rating each adjective using a 5-point rating scale ranging from 1 (*very slightly or not at all*) to 5 (*extremely*).

Other Measures Administered to Online Community Sample Participants

Community participants completed a more extensive battery of measures than did undergraduates, enabling us to examine associations for our emergent PE factors with other measures using data from this sample. Other measures included the second edition of the Big Five Inventory (BFI-2; Soto & John, 2017). Participants rated themselves on all BFI-2 items using a 5-point scale ranging from 1 (*disagree strongly*) to 5 (*agree strongly*).

Participants also completed the 18-item Narcissistic Admiration and Rivalry Questionnaire (NARQ; Back et al., 2013), which includes narcissistic (a) Admiration (9 items; e.g., "am special") and (b) Rivalry scales (9 items; e.g., "want my rivals to fail"). Participants responded to the NARQ items using a 6-point scale ranging from 1 (*not agree at all*) to 6 (*agree completely*). Additionally, participants were administered the Grandiosity (7 items) and Exhibitionism (6 items) scales from the Comprehensive Assessment of Traits Relevant to Personality Disorder (CAT-PD; Simms et al., 2011). Participants responded to these items using a 5-point scale ranging from 1 (*very untrue of me*) to 5 (*very true of me*).

Table 2
Adjectives Included to Assess Potential Positive Emotionality Facets

Facet	Specific adjectives
Joviality	Happy, joyful, playful, silly, delighted, cheerful, amused, excited
Energy/vigor	Enthusiastic, lively, energetic, active
Self-assurance	Proud, strong, fearless, confident, bold, daring
Attentiveness	Concentrating, determined, inspired, alert, interested, attentive
Serenity	Relaxed, calm, peaceful, at ease, content
Gratitude	Appreciative, blessed, grateful, thankful
Social affection	Sympathetic, admiration, forgiving, affectionate, warmhearted, kindhearted, close to others, compassionate, loving
Awe	Meaningful, amazed, fascinated, reflective, in awe, mindful

Note. Each adjective was predicted to have its strongest factor loading on the factor in the same row.

Finally, participants completed select scales from the Expanded Version of the Inventory of Depression and Anxiety Symptoms (IDAS-II; Watson et al., 2012). Symptom scales from the IDAS-II that were administered included Dysphoria (10 items; e.g., “felt depressed”), Social Anxiety (6 items), Euphoria (5 items; e.g., “had so much energy it was hard to sit still”), and Mania (5 items; “thoughts raced”). Participants indicated the extent to which they experienced symptoms over the past 2 weeks using a 5-point scale ranging from 1 (*not at all*) to 5 (*extremely*).

Results

Overview

All analyses were conducted using SAS Version 9.4. Descriptive statistics and coefficient α estimates for all study measures are provided in Online Supplemental Table S3. Coefficient α estimates for all study measures $> .70$, with most estimates $> .80$.

Next, our primary analyses involved conducting hierarchical EFAs of PE ratings as described. All EFAs were conducted using principal factor analyses and were based on polychoric correlation matrices because participants rated PE items using a 5-point response scale. We used both Velicer’s minimum average partial (MAP) test and parallel analysis to help determine the maximum number of factors to extract in our EFAs. Note that we report results from principal factor analyses subsequently. However, we conducted parallel analyses and the MAP test using principal components analyses (PCAs) because the use of principal factor analysis when conducting these procedures can suggest extracting an overly large number of factors (O’Connor, 2000). Furthermore, although we took results from these parallel analyses and MAP tests conducted with PCAs into account for informing our EFAs, we ultimately sought to identify the largest number of well defined (i.e., factors on which three or more items loaded strongly), replicable PE dimensions. For conducting these EFAs, we began by extracting a general PE factor in both samples and then extracted solutions with an increasingly larger number of factors (Forbes et al., 2017). When extracting two or more factors, factors were rotated to the oblique simple structure using promax. We also examined the extent to which factors replicated across samples using comparability coefficients (Everett, 1983), an approach allowing coefficients to be computed using both the undergraduate and community data sets. Comparability coefficients $\geq .90$ indicate strong factor similarity (Everett, 1983).

Additionally, we report Pearson correlations for emergent dimensions from our EFAs with other study variables in the community data set. We report correlations for both (a) a general PE factor from a single-factor solution and (b) the factor solution with the largest number of well-defined PE factors. Factors identified in our EFAs were modeled using regression-based factor scores. Finally, we conducted a series of multiple regression analyses in which factor scores reflecting PE facet dimensions were entered simultaneously as independent variables along with PANAS-X NA ratings when examining their associations with other study variables. Unlike all other analyses described, these regression analyses were not preregistered. They were added after further consideration when revising this manuscript given that scores representing some PE dimensions from our EFAs were strongly associated with PANAS-X NA ratings as

described subsequently. We considered the statistical significance of all associations at a $p < .001$ level.

Factor Analytic Results

Preliminary Analyses

Parallel analyses conducted in both the community and undergraduate samples indicated that up to four factors could be extracted in our EFAs. However, results from the MAP test indicated that seven- (mean squared partial correlation = .0147) and eight-factor solutions (mean squared partial correlation = .0122) may be optimal in the community and undergraduate data sets, respectively. This lack of convergence across these two procedures may provide evidence for a hierarchical factor structure wherein multiple, meaningful factor solutions are tenable (Forbes et al., 2017).

Factor Solutions With One to Three Factors

First, adjectives assessing high-arousal PE such as feeling enthusiastic, joyful, and cheerful loaded most strongly (i.e., corresponding item factor loadings $> .75$) on a single general factor in each data set. Across samples, all 48 PE items loaded $> .40$ on this general factor. Comparability coefficients scored in both data sets for this factor exceeded .99.

Next, factor loadings from two-factor solutions across samples are shown in Online Supplemental Table S4. When extracting two factors, item adjective scores such as *confident*, *bold*, and *daring* (factor loadings $\geq .65$ across samples) loaded strongly onto the first factor across samples. A range of other items assessing feeling excited, relaxed, and at ease also marked this first factor. Adjectives such as *sympathetic*, *loving*, and *compassionate* loaded strongly on the second factor (factor loadings $> .75$ across samples). Thus, emergent factors in the two-factor solution represented a distinction between self- and interpersonally oriented PE. Accordingly, we labeled the first and second factors *Self-Oriented Positive Emotionality* and *Social Affection*, respectively. The average level of communality for items was .58 and .47 in the community and undergraduate data sets, respectively, indicating an acceptable level of communality (i.e., values $< .40$ may be problematic; Costello & Osborne, 2005). This two-factor solution replicated well across samples (comparability coefficients for each factor $\geq .98$ in all cases). Both factors correlated strongly in each data set (interfactor $r = .63$ and $.61$ in the community and undergraduate samples, respectively).

As shown in Online Supplemental Table S5, when extracting three factors, adjective scores such as *sympathetic* and *compassionate* again loaded strongly onto a *Social Affection* factor (i.e., Factor II in both data sets). Additionally, adjective scores reflecting lower-arousal PE experiences assessed by items such as *calm* and *relaxed* (loadings $> .80$ across samples) loaded onto a factor labeled *Serenity* (Factor I and Factor III in the community and undergraduate data sets, respectively). Finally, items assessing high-arousal PE (e.g., *bold*, *excited*) loaded $> .65$ onto Factor III in the community data and Factor I in the undergraduate data. We labeled this factor *Joviality*, a term commonly used to label factors reflecting an array of high-arousal PE experiences (e.g., Watson & Clark, 1999). All PE factors in each data set again were moderately to strongly positively intercorrelated, with all interfactor

correlations $\geq .40$. For these three-factor solutions, the average level of communality was .63 and .51 in the community and undergraduate data sets, respectively, again indicating acceptable commonality levels.

All three factors replicated across samples (all comparability coefficients for parallel factors $\geq .93$), but it is worth noting that the Serenity factor was broader in nature in the community than undergraduate data. Specifically, only four items (i.e., *calm, relaxed, at ease, peaceful*) loaded $> .50$ on the Serenity factor in the undergraduate data. These same items loaded strongly on Serenity in the community data. However, adjectives such as *determined* and *attentive* also loaded strongly onto Serenity in the community data (both loadings $\geq .50$), but instead loaded most strongly Joviality in the undergraduate data (loadings again $\geq .50$). Although some items showed differential loading patterns, overall factor comparability still may have been strong due to the same core item sets loading most strongly on Serenity as well as other items having similar loadings across samples (e.g., adjectives such as *daring, excited, in awe* all loaded very weakly on Serenity across samples).

Factor Solutions With Four Factors

Next, four-factor solutions from the community and undergraduate data sets are shown in Tables 3 and 4, respectively. Items assessing high-arousal PE (e.g., *excited, playful, energetic, daring*) loaded strongly onto Factor I in the community data and Factor II in the undergraduate data. We again labeled these factors *Joviality*. Adjectives assessing approach-oriented PE experiences such as *bold* and *daring* tended to load more strongly on this Joviality factor in the community than undergraduate data set, whereas adjectives such as *energetic, enthusiastic, and lively* showed comparatively stronger loadings on this factor in the undergraduate data set. Still, many of the same items loaded strongly on these factors, which our comparability coefficient analyses indicated were similar (both coefficients $\geq .93$). Next, a *Social Affection* factor again emerged (Factor II in the community data set; Factor I in the undergraduate data set), and comparability coefficients scored in either data set indicated strong factor similarity (both coefficients $\geq .98$).

Adjectives such as *relaxed* and *peaceful* again loaded strongly onto a *Serenity* factor (Factor III in the community data set; Factor IV in the undergraduate data set). A larger number of adjectives loaded strongly onto Serenity in the community than undergraduate results (i.e., only four items with loadings $> .50$ in the undergraduate data), though this factor was comparable across samples overall (both comparability coefficients $\geq .94$). Finally, adjectives such as *determined, alert, and attentive* loaded strongly onto an *Attentiveness* factor that was not identified in previous factor solutions (Factor IV in the community data set; Factor III in the undergraduate data set). Both comparability coefficients for this fourth factor were $\geq .90$. The average level of communality was .67 and .54 for the four-factor solutions in the community and undergraduate datasets, respectively, once again indicative of acceptable commonality levels.

A hierarchical depiction of solutions ranging from one to four factors is shown in Figure 1, which depicts the “unfolding” of factor structures across samples. As shown in Figure 1, these hierarchies closely parallel each other, with the exception of Attentiveness from the four-factor solutions having its strongest

Table 3

Promax Factor Loadings of the Positive Emotionality Adjectives in the Community Sample

Item adjective	Joviality	Social affection	Serenity	Attentiveness
Daring	.86	-.36	.02	.11
Excited	.85	.01	.08	-.06
Amazed	.78	.25	-.14	-.05
Fascinated	.73	.16	-.19	.07
Bold	.72	-.18	.06	.30
In awe	.71	.22	-.06	-.05
Silly	.68	.25	-.24	-.27
Admiration	.63	.32	-.06	.01
Amused	.61	.13	.15	-.06
Inspired	.56	.23	.01	.22
Playful	.55	.22	.21	-.10
Active	.54	-.04	.13	.29
Fearless	.53	-.34	.11	.22
Lively	.52	.08	.31	.11
Energetic	.51	.05	.26	.19
Enthusiastic	.48	.14	.36	.04
Delighted	.47	.27	.32	-.03
Proud	.39	.01	.31	.20
Kindhearted	-.16	.90	.06	.12
Sympathetic	-.10	.86	-.21	.19
Compassionate	-.14	.85	-.03	.20
Warmhearted	.00	.82	-.01	.12
Loving	.05	.76	.25	-.16
Affectionate	.22	.65	.13	-.11
Forgiving	.17	.57	.00	.00
Grateful	.07	.55	.20	.15
Appreciative	.15	.53	.10	.21
Thankful	.16	.47	.25	.11
Close to others	.08	.46	.46	-.12
Blessed	.19	.44	.10	.12
Meaningful	.17	.40	.27	.19
At ease	-.13	-.02	.95	-.01
Relaxed	-.06	-.08	.95	-.05
Calm	-.19	-.03	.94	.08
Peaceful	.08	.11	.72	.04
Content	-.07	.15	.72	.07
Happy	.19	.16	.68	-.07
Confident	.22	-.19	.58	.33
Cheerful	.30	.25	.47	.00
Joyful	.41	.26	.46	-.13
Alert	-.11	.05	.03	.73
Attentive	-.11	.12	.17	.71
Determined	.04	.08	.11	.67
Concentrating	.02	.20	-.06	.66
Mindful	.03	.33	.05	.52
Reflective	.27	.28	-.35	.52
Interested	.13	.21	.19	.49
Strong	.29	.00	.28	.45

Note. $N = 375$. Factor loadings $\geq .40$ are bolded. Joviality correlated .55, .62, and .52 with Social Affection, Serenity, and Attentiveness, respectively. Social Affection correlated .52 and .44 with Serenity and Attentiveness, respectively. Serenity and Attentiveness correlated .53.

path coefficient with different factors from the three-factor solutions (i.e., .72 with Serenity in the community data; .87 with Joviality in the undergraduate data). This difference likely emerged due to item content reflecting Attentiveness (e.g., *attentive, determined*) loading most strongly on different factors across data sets in the three-factor solutions as reviewed. Acknowledging this difference, all factors from the four-factor solutions were well defined, psychologically meaningful, and generally replicable as reviewed.

Table 4
Promax Factor Loadings of the Positive Emotionality Adjectives in the Undergraduate Sample

Item adjective	Social affection	Joviality	Attentiveness	Serenity
Sympathetic	.80	-.03	-.07	-.08
Kindhearted	.74	.00	-.11	.21
Appreciative	.73	-.07	.16	-.11
Compassionate	.71	-.02	.09	.02
Warmhearted	.69	.24	-.11	.07
Loving	.69	.25	-.10	.03
Grateful	.67	-.03	.23	.02
Forgiving	.65	-.06	-.02	.08
Affectionate	.64	.19	-.12	-.04
Thankful	.58	.00	.26	.04
Meaningful	.57	.12	.20	.01
Blessed	.48	.08	.33	-.05
Admiration	.44	.20	.27	-.28
Mindful	.43	-.11	.37	.20
Close to others	.35	.25	.06	.17
Lively	-.02	.83	-.07	.12
Energetic	.05	.82	.00	-.03
Excited	.07	.74	.11	-.01
Enthusiastic	.08	.70	.12	-.01
Cheerful	.18	.69	-.09	.17
Playful	.11	.59	-.02	.07
Happy	.25	.58	-.12	.16
Daring	-.23	.54	.36	-.08
Joyful	.37	.53	-.04	.10
Amused	.13	.53	.21	-.02
Silly	.19	.43	.01	-.15
Active	-.03	.40	.25	.17
Delighted	.31	.36	.15	.19
In awe	.25	.34	.22	-.05
Determined	.04	-.04	.73	.09
Alert	.14	-.14	.60	.09
Confident	-.25	.26	.55	.29
Concentrating	.14	-.19	.54	.10
Attentive	.17	.06	.54	.10
Bold	-.18	.46	.53	-.03
Inspired	.09	.29	.53	-.08
Proud	.07	.19	.44	.14
Fearless	-.31	.28	.43	.17
Reflective	.20	.10	.42	-.11
Strong	.01	.21	.41	.25
Fascinated	.17	.31	.39	-.22
Interested	.09	.37	.38	.04
Amazed	.12	.38	.37	-.19
Calm	.02	-.19	.14	.82
Relaxed	-.04	.15	-.11	.79
At ease	-.01	.09	.08	.75
Peaceful	.10	.02	.13	.63
Content	.25	.12	.26	.31

Note. $N = 447$. Factor loadings $\geq .40$ are bolded. Social Affection correlated .55, .44, and .36 with Joviality, Attentiveness, and Serenity, respectively. Joviality correlated .54 and .47 with Attentiveness and Serenity, respectively. Attentiveness and Serenity correlated .39.

Solutions With Five or More Factors

Although we found evidence for four replicable factors, convergence in results was poorer when extracting five factors in each data set. The fourth factor in the community data, on which items such as *alert* and *determined* loaded strongly, had no clear parallel in the undergraduate data when extracting five factors; specifically, all comparability coefficients for this community data set factor were $< .80$ with all undergraduate data set factors. Moreover, the fifth

factor in the community data set on which adjectives such as *grateful* and *thankful* loaded strongly did not have a strong parallel factor (i.e., highest comparability coefficient = .87 when using the community data set for scoring; no coefficients $> .83$ when scoring in the undergraduate data).

Similar issues regarding poor cross-sample factor comparability arose for six-factor solutions. When extracting six factors, adjectives such as *alert* and *attentive* loaded strongly onto the fifth factor in the community data set, but this factor did not appear to replicate in the undergraduate data set (i.e., no comparability coefficient $\geq .75$). We also identified a Heywood case in the community data set, as the adjective *relaxed* loaded 1.02 on the first factor in this data set. Heywood cases may emerge due to overfactoring and factors being narrowly defined, among other reasons (de Winter & Dodou, 2012). Therefore, we did not consider these factor solutions or solutions with greater numbers of factors further, as we focused on examining associations subsequently for factor scores representing the four replicable factors described.

Online Community Sample Factor Associations

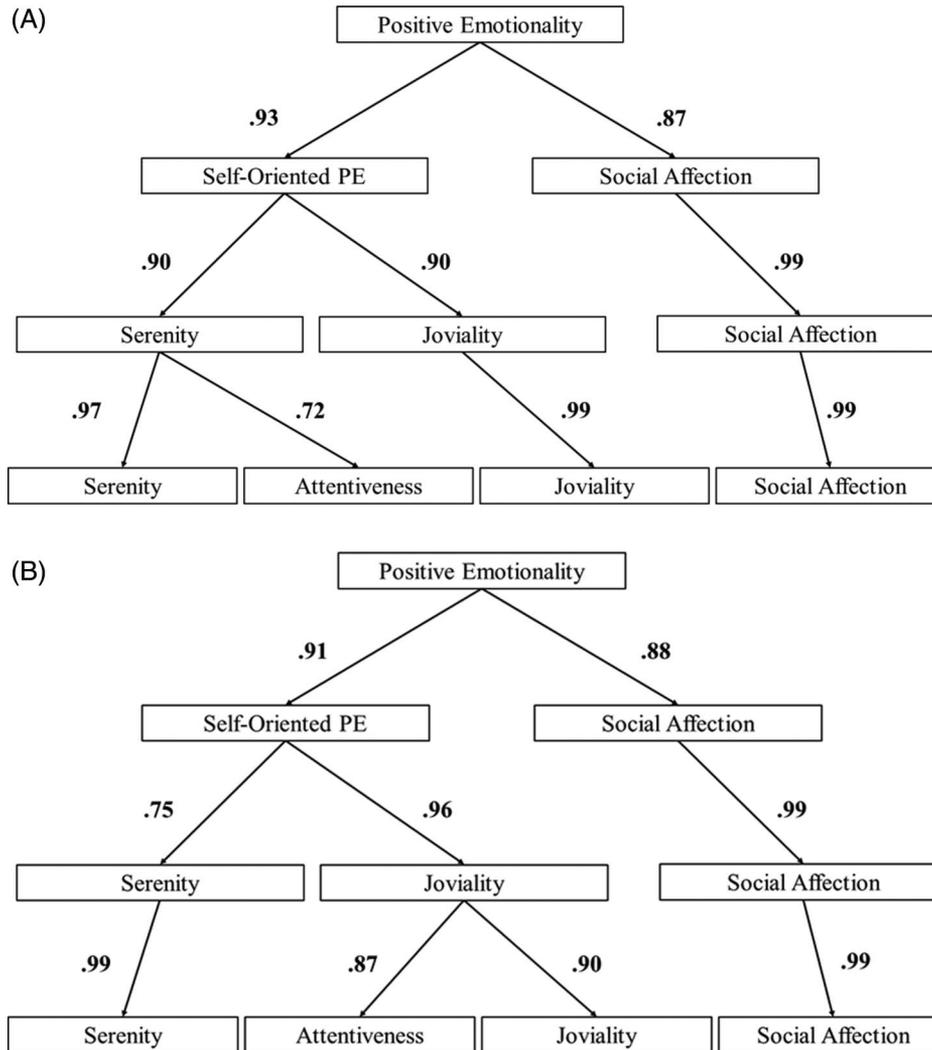
We first examined correlates for emergent PE dimensions with PANAS-X NA scores. Correlations with PANAS-X NA for Joviality, Social Affection, Serenity, and Attentiveness were $-.06$ ($p = .22$), $-.14$ ($p = .006$), $-.57$ ($p < .001$), and $-.22$ ($p < .001$), respectively; thus, Serenity's correlation was much stronger than the correlations for other PE dimensions.

Next, Table 5 presents correlations for emotionality dimensions with other study variables. As predicted, PANAS-X NA was associated robustly with BFI-2 Negative Emotionality and internalizing symptoms. The general PE dimension displayed its strongest correlation with BFI-2 Extraversion ($r = .67$), correlated at least moderately with all FFM domain ratings, and showed some other robust associations (e.g., $r = .50$ with IDAS-II Euphoria).

At a general level, all four PE dimensions displayed robust correlates with BFI-2 Extraversion (all $r_s > .40$). However, there was notable variation in the magnitude of these correlates; for example, Joviality correlated .66 with extraversion, whereas Social Affection correlated .41 with this same trait dimension (z estimate for correlation comparison = 6.60; $p < .001$). Furthermore, Joviality correlated significantly more strongly with IDAS-II Euphoria, NARQ Admiration, and CAT-PD Exhibitionism than other PE facets (all correlations significantly stronger than correlates for all other facets at $p < .001$).

Social Affection's most distinctive correlates were with BFI-2 Agreeableness ($r = .64$; correlation significantly different from those for other PE facets at $p < .001$) and with NARQ Rivalry scores ($r = -.40$). Next, Attentiveness showed the strongest correlation with BFI-2 Conscientiousness of any PE facet ($r = .54$; the association was not significantly different than that for Serenity, $r = .48$). Attentiveness also correlated strongly with BFI-2 Open-Mindedness ($r = .53$; correlation significantly different than those for other PE facets at $p < .001$). Finally, Serenity correlated very strongly and negatively with BFI-2 Negative Emotionality ($r = -.77$; $p < .001$ for comparisons with correlations for other PE facets). Unlike other PE facets, Serenity scores also were associated strongly and negatively with IDAS-II Dysphoria and Social Anxiety scores ($r_s \geq 1.50$; $p < .001$, for all comparisons with other PE facet correlations).

Figure 1
Hierarchical Models of Positive Emotionality in the Community and Undergraduate Samples



Note. The first hierarchy in Panel A ($N = 375$) is from the community sample, and Panel B ($N = 447$) is from the undergraduate sample. These two hierarchies mirror one another with the exception of the Attentiveness factors from the four-factor solutions having different primary path coefficients with factors from the three-factor solutions across these data sets. Only the strongest path coefficients for each factor with factors from the previous level are shown.

Multiple Regression Analyses Controlling for Negative Emotionality

Follow-up multiple regression analyses were conducted to examine the extent to which PE facet dimensions—and Serenity in particular—continued to show robust associations even when accounting for the overlap (a) among PE scores and (b) for PE scores with PANAS-X NA. Examination of the variance inflation factor (VIF) to detect issues related to multicollinearity indicated that no independent variable had a VIF estimate of ≥ 4.0 , a benchmark often used for identifying problematic multicollinearity levels (Fox, 1991).

Table 6 presents standardized β weights from these regressions. These results reinforce several aspects of the correlational analyses,

including Joviality being tied closely to extraversion ($\beta = .55$; $\beta_s < .15$ for other PE facets). For example, Social Affection again showed specificity in its associations with BFI-2 Agreeableness ($\beta = .69$), and high-arousal PE reflected by Joviality also associated strongly with specific externalizing measures (e.g., CAT-PD Exhibitionism). Joviality also was very strongly associated with IDAS-II Euphoria (e.g., “had so much energy”; $\beta = .75$), likely due to both measures assessing energy and excitement.

Perhaps most notably, Serenity showed few robust associations after controlling for its overlap with other PE facets and PANAS-X NA scores, including showing only weak associations with internalizing symptoms (e.g., IDAS-II Dysphoria). However, Serenity still associated strongly with BFI-2 Negative Emotionality ($\beta = -.61$).

Table 5
Correlates for Emotionality Dimensions in the Online Community Sample

Scale	General NA	General PE	Joviality	Social affection	Serenity	Attentiveness
Personality						
BFI-2 Negative Emotionality	.68	-.56	-.37	-.27	-.77	-.40
BFI-2 Extraversion	-.33	.67	.66	.41	.59	.49
BFI-2 Agreeableness	-.42	.50	.20	.64	.43	.34
BFI-2 Conscientiousness	-.41	.44	.20	.31	.48	.54
BFI-2 Open-Mindedness	-.21	.44	.33	.36	.27	.53
Psychopathology						
IDAS-II Euphoria	.07	.50	.67	.23	.37	.23
NARQ Admiration	-.11	.47	.57	.20	.36	.36
IDAS-II Dysphoria	.78	-.39	-.17	-.24	-.60	-.31
IDAS-II Social Anxiety	.66	-.33	-.17	-.14	-.50	-.30
CAT-PD Exhibitionism	.02	.30	.46	.06	.24	.14
NARQ Rivalry	.41	-.26	-.01	-.40	-.25	-.22
IDAS-II Mania	.50	-.02	.21	-.06	-.18	-.10
CAT-PD Grandiosity	.19	.00	.20	-.20	.00	-.05

Note. $N = 375$. Correlations $\geq |.40|$ are bolded. All correlations shown are Pearson correlations, and all correlations $\geq |.18|$ are significant at $p < .001$. General NA = Negative affectivity scores assessed using the Positive and Negative Affect Schedule-Expanded Form; CAT-PD = Comprehensive Assessment of Traits Relevant to Personality Disorder; IDAS-II = Expanded Version of the Inventory of Depression and Anxiety Symptoms; NARQ = Narcissistic Admiration and Rivalry Questionnaire.

This association was noteworthy given that it was *stronger in magnitude* than PANAS-X NA's association ($\beta = .34$) with BFI-2 Negative Emotionality, despite both PANAS-X NA and BFI-2 Negative Emotionality being directly used to assess tendencies toward experiencing negative mood states.

Discussion

Summary of Hierarchical Structures and Implications for Assessing Positive Emotionality

Overview and Implications of Factor Analytic Findings

Our primary goal was to articulate a hierarchical structure of dispositional PE ratings to inform assessment approaches in future

research. We predicted that as many as eight, and at least five, replicable PE facets would emerge when examining hierarchical PE structures. However, factor solutions with five or more factors were problematic, as they were challenging to interpret and yielded one or more nonreplicable dimensions. At the lowest level of our PE factor hierarchy, we identified four factors of Joviality, Attentiveness, Serenity, and Social Affection, consistent with our timestamped predictions for a four-factor structure (again, see <https://osf.io/u8apz>). These factors generally were replicable across samples, although some specific adjectives loaded most strongly onto different factors in some cases.

The four replicable factors we identified represented four of the five hypothesized factors from the five-factor solution (i.e., Joviality, Self-Assurance, Attentiveness, Serenity, Social Affection), with

Table 6
Multiple Regression Models Examining Associations for the Emotionality Dimensions in the Online Community Sample

Scale	General NA	Serenity	Joviality	Social affection	Attentiveness	Model R^2
Personality						
BFI-2 Agreeableness	-.32*	-.01	-.24*	.69*	.10	.56
BFI-2 Negative Emotionality	.34*	-.61*	-.02	.12*	-.06	.69
BFI-2 Open-Mindedness	-.25*	-.33*	.17	.20*	.48*	.35
BFI-2 Extraversion	-.24*	.05	.55*	-.01	.13	.53
BFI-2 Conscientiousness	-.16	.26*	-.25*	.09	.46*	.42
Psychopathology						
IDAS-II Dysphoria	.64*	-.23*	.07	-.04	-.07	.66
IDAS-II Social Anxiety	.55*	-.16	-.02	.09	-.12	.47
NARQ Rivalry	.41*	.14	.27*	-.52*	-.11	.36
IDAS-II Mania	.46*	-.03	.40*	-.14	-.12	.34
IDAS-II Euphoria	.15	.15	.75*	-.18*	-.12	.50
NARQ Admiration	-.11	-.07	.65*	-.18*	.12	.36
CAT-PD Exhibitionism	.05	.08	.60*	-.26*	-.08	.27
CAT-PD Grandiosity	.21	.13	.42*	-.42*	-.10	.21

Note. $N = 375$. All values are standardized β weights, and all values $\geq |.30|$ are bolded. Standardized β weights that are significant at $p < .001$ are highlighted with an asterisk. All overall models were significant at $p < .001$. General NA = Negative affectivity scores assessed using the Positive and Negative Affect Schedule-Expanded Form; CAT-PD = Comprehensive Assessment of Traits Relevant to Personality Disorder; IDAS-II = Expanded Version of the Inventory of Depression and Anxiety Symptoms; NARQ = Narcissistic Admiration and Rivalry Questionnaire.

the exception of a distinct Self-Assurance factor failing to emerge when examining five-factor structures. We also hypothesized that other distinct factors reflecting dimensions such as gratitude would be identified in solutions with six or more factors, but factors representing these dimensions also failed to emerge in more complex factor solutions.

The Importance of Assessing Distinct Positive Emotionality Facets

Although we were not able to identify as many meaningful PE facets as predicted, results from the community data indicated that the replicable PE dimensions from the four-factor solutions still showed distinctive associations that would be masked by focusing analyses solely on composite PE ratings. For example, Joviality showed the clearest links with extraversion (hypothesized $r = .60$, actual $r = .66$), consistent with prior research. In contrast, PE experiences reflected by Social Affection (e.g., *affectionate*) associated robustly with agreeableness (hypothesized $r = .55$, actual $r = .64$) but were unrelated to extraversion in our regression analyses. This is notable given that extraversion facet scales assessing high-arousal PE (e.g., *liveliness*) from many omnibus personality inventories often are given general labels such as “Positive Emotions” (see Watson, Stasik, Ellickson-Larew, et al., 2015, for review), which might suggest a neat correspondence between PE and extraversion. However, both our results and broadened PE conceptualizations indicate that other FFM traits should be considered in addition to extraversion when evaluating alignment for PE dimensions with broader trait frameworks such as the FFM.

This was predicted given the content parallels for item adjectives used in our factor analyses with measures of specific FFM traits (e.g., Social Affection items such as *sympathetic* with agreeableness item content). Although these examples of PE overlap with FFM traits other than extraversion are not surprising then, they illustrate *exactly why* researchers should be interested in advancing understanding of hierarchical models and assessing PE at the facet level when possible. For example, focusing analyses only on a general PE dimension when studying how PE is associated with personality pathology may mask distinctive relations for Social Affection item content, which is not included in many existing PE measures (again, see Table 1).

Further research is needed to build on our findings to reach consensus on how to optimally assess PE at different levels of breadth. However, in the meantime, we encourage researchers to use measures that were created explicitly to assess PE at the facet level when possible. Examples of such measures reviewed include the TAI and DPES, which through their facet scales assess many of the emotional experiences reflected by our emergent factors, albeit in somewhat different ways (e.g., the TAI includes a separate scale assessing vigor/energy, which the DPES does not). In making these recommendations, we are not advising that measure scores reflecting general PE should not ever be included in study analyses, but rather, that consideration of distinctive facet dimensions represents another important level of analysis.

It also is important to recognize that although the direction and magnitude of most associations aligned with our predictions, some associations were stronger than anticipated. This was the case for Serenity especially given its very strong associations with NE. Next, we review the implications of these findings for PE classification by discussing the substantive nature of each PE dimension,

giving emphasis to discussing findings for Serenity in light of these results.

Serenity

Serenity was moderately to strongly intercorrelated with other PE facets (e.g., $r = .62$ with Joviality in the community data), indicating that it overlaps strongly with other aspects of the broader PE domain. We predicted that Serenity also would associate strongly with NE ratings. However, the magnitude of the Serenity-NE associations was even stronger than predicted, particularly the $-.77$ correlation between Serenity with BFI-2 Negative Emotionality; Serenity also correlated $-.57$ with PANAS-X NA, though this correlation is more in line with prior research (e.g., Payne & Schnapp, 2014). Placing this association for Serenity with BFI-2 Negative Emotionality in context, correlations of this magnitude often are observed between *different measures of the same construct* (e.g., different measures of negative emotionality correlate $.75-.80$; Watson, Stasik, Chmielewski, et al., 2015). Furthermore, Serenity continued to be strongly associated with BFI-2 Negative Emotionality even in our regression analyses when controlling for PANAS-X NA, which is noteworthy given that both BFI-2 Negative Emotionality and PANAS-X were used to assess tendencies toward experiencing NE.

Why then were these associations so strong in magnitude? When considering post hoc explanations, this Serenity association with BFI-2 Negative Emotionality may have resulted from similar administration procedures for both our emotionality adjectives and the BFI-2. Specifically, the BFI-2 items are written as short phrases or lists of adjectives (e.g., “is outgoing, sociable”), with many of the BFI-2 Negative Emotionality items consisting of content that is very similar in nature to the item content that loaded strongly on Serenity. For example, the BFI-2 Negative Emotionality scale includes items such as “can be tense” as well as reverse-keyed items assessing emotional stability (e.g., “handle stress well”) aligning closely with items that loaded strongly onto Serenity (e.g., *relaxed, calm*). In contrast, all PANAS-X NA items directly assess NE experiences and do not require reverse-keying for scoring, which may explain in part why Serenity associated more strongly with BFI-2 Negative Emotionality than PANAS-X NA. Going forward, it will be important to directly compare the extent to which Serenity associates more strongly with NE assessed via the BFI-2 than other trait measures. For example, the HEXACO Personality Inventory-Revised (HEXACO PI-R; Lee & Ashton, 2018) assesses NE using longer sentence statements than those provided in the BFI-2, and many HEXACO PI-R items focus on NE experienced in specific circumstances (e.g., “get anxious about making important decisions”).

Acknowledging these differences across measures, different models provide similar descriptions of emotional stability (or low NE) as reflecting tendencies toward being relaxed and calm across situations (Lee & Ashton, 2018; Soto & John, 2017; Watson, Stasik, Ellickson-Larew, et al., 2015). Item content related to this definition loaded strongly onto Serenity here as reviewed, highlighting possible “jingle-jangle” issues (i.e., content assessing tendencies toward feeling calm being given different labels). Taken together, the strong associations for Serenity and NE likely are due to a combination of construct overlap and methodological factors (i.e., similarities in item content and wording). At a minimum, our results and consideration of these issues indicate that unlike other PE variants that are more distinct from NE, Serenity may represent a blend of low NE

and high PE, as identified previously (Payne & Schnapp, 2014; Watson & Clark, 1999).

However, our results are not conclusive, and we hope that future research will investigate the degree to which specific aspects of Serenity are distinct from NE to inform the affective assessment. Low-arousal affective experiences (e.g., feeling peaceful, relaxed) reflecting Serenity are described as core to the broader PE domain across many models (e.g., Cowen et al., 2019; Fredrickson, 2013). Important cross-cultural differences in experiencing and valuing low-arousal experiences of PE also have been consistently identified, and PE experiences may vary according to other factors such as age (e.g., older adults may experience less high-arousal PE; Tsai, 2017). Furthermore, other research indicates a meaningful distinction between experiences of contentment (e.g., feeling content, satisfied) and tranquility (e.g., feeling calm, serene; Berenbaum et al., 2019), but only five adjectives broadly related to these constructs were included in our study to model a potential Serenity facet. Therefore, it will be important to determine the degree to which different types of low-arousal PE identified in previous research such as contentment and tranquility appear distinct from NE across contexts and when using different assessment approaches (e.g., assessing PE experiences in specific situations).

Social Affection

Item content reflecting Social Affection emerged as distinguishable from other aspects of PE even when extracting two factors across samples, highlighting its distinctiveness. Social Affection's robust associations with agreeableness were predicted as reviewed but demonstrate—perhaps more than any other facet—the importance of considering distinct dimensions when assessing PE. For example, in addition to Social Affection and Joviality showing differential associations with extraversion as discussed, they had markedly different associations with grandiosity and exhibitionism. These findings demonstrate clearly that specific PE ratings are associated meaningfully with traits other than extraversion, with emotional experiences represented by Social Affection being important for building social bonds and for self-regulation in social contexts based on prior research (e.g., Robinson, 2007).

Joviality

Joviality (e.g., feeling excited) seems most differentiable from other PE facets identified in that it reflects high-arousal PE, though some specific items that loaded strongly onto Attentiveness (e.g., *determined*) also may capture high-arousal PE to an extent. In addition to Joviality associating robustly with extraversion as predicted, other associations for Joviality with grandiosity, exhibitionism, and IDAS-II Euphoria (e.g., “had so much energy”) support this interpretation. These associations indicate distinctive connections for Joviality's unique variance with specific aspects of externalizing psychopathology and hypomania, consistent with other recent research (e.g., Gruber, 2011; Stanton et al., 2019; Watson, Stasik, Ellickson-Larew, et al., 2015).

Attentiveness

Finally, consistent with our predictions and prior research, Attentiveness displayed specificity in its associations with conscientiousness.

Again, this is not surprising based on content grounds (i.e., conscientiousness measures assess motivation and persistence), but it provides another example of how specific PE facets are associated with different trait profiles. One aspect of our findings that was not anticipated centers on Attentiveness's positive associations with open-mindedness, a trait typically weakly linked with emotionality ratings (e.g., Watson et al., 2000). When considering post hoc explanations, these associations may have been identified due to the Attentiveness factor being represented by item content such as *reflective* that was not predicted to load strongly onto Attentiveness in our analyses. Some items used to rate open-mindedness here assess tendencies toward being intellectually curious and interested in ideas, which someone describing themselves as reflective may be likely to strongly endorse. Given that these associations with open-mindedness are novel in some ways, it will be interesting to explore connections for this FFM domain with specific PE facets going forward.

The emergence of the Attentiveness factor and these associations also reflect expanded definitions of the PE domain as reviewed. For example, some of the items loading strongly onto Attentiveness (e.g., *concentrating*, *alert*) appear to include cognitive or thought-based elements. This may raise concerns about the relevance of content assessed by these items to the PE domain; however, Attentiveness was moderately to strongly correlated with other emergent PE factors when examining four-factor solutions. Furthermore, all Attentiveness items—and all PE items included in our factor analyses more generally—loaded strongly onto a common factor when examining single-factor solutions. Taken together, this provides some basic evidence that all items included here reflect the same broad domain.

Future Directions and Limitations

Our results inform PE classification and assessment in the ways noted, but analyses of PE state ratings could provide different results. Relatedly, we were unable to examine how different functional and contextual factors may serve to differentiate various PE experiences (e.g., Attentiveness may facilitate goal pursuit more than some other PE types). It also would have been interesting to examine PE facet associations with other psychopathology commonly studied in relation to PE not assessed here (e.g., substance use). Thus, we hope future work will advance research in this area using other study designs (e.g., using intensive longitudinal designs).

Additionally, we included many adjectives in our factor analyses, yet we still may have failed to include a sufficient number of adjectives reflecting specific PE types that would have enabled us to identify more than four replicable dimensions in our hierarchical EFAs. This potentially could be important for making finer-grained distinctions among different types of low-arousal PE for example (e.g., tranquility vs. contentment; Berenbaum et al., 2019). Related to this consideration, it will be important to evaluate low-arousal PE and NE overlap going forward as discussed, including determining if Serenity item content aligns more closely with some specific measures of NE than others (e.g., NE assessed via the BFI-2 vs. HEXACO PI-R). Finally, views of what constitutes PE have expanded over time (e.g., by including attentiveness, compassion), but researchers continue to disagree about the boundaries of the PE domain. Acknowledging these issues, we hope that future research will build on these results in the ways described to sharpen understanding of hierarchical PE structures to promote consistency in assessment approaches across studies.

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Received December 16, 2020

Revision received May 20, 2021

Accepted May 25, 2021 ■