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Discrete Emotions or Dimensions? The Role of Valence Focus and Arousal Focus

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The present study provides evidence that valence focus and arousal focus are important processes in determining whether a dimensional or a discrete emotion model best captures how people label their affective states. Individuals high in valence focus and low in arousal focus fit a dimensional model better in that they reported more co-occurrences among like-valenced affective states, whereas those lower in valence focus and higher in arousal focus fit a discrete model better in that they reported fewer co-occurrences between like-valenced affective states. Taken together, these findings suggest that one static, nomothetic theory may not accurately describe the subjective affective experience of all individuals.

INTRODUCTION

Most researchers agree that affect has at least two qualities: *valence* (pleasantness or hedonic value) and *arousal* (bodily activation). Some theorists emphasise one or the other quality as basic to affective experience (e.g. Duffy, 1941; Lazarus, 1991; Ortony, Clore, & Collins, 1988; Thayer, 1989; Zajonc, 1980). Others incorporate both (e.g. Lang, 1994; Reisenzein, 1994; Russell, 1980; Schacter & Singer, 1962; Schlosberg, 1952). Even some theorists who emphasise basic discrete emotions allow a role for valence and arousal (e.g. Roseman, Spindel, & Jose, 1990; Smith & Ellsworth, 1985). There is evidence that valence and arousal are pancultural (Russell, 1991) and present in young children (Russell & Bullock, 1985).

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Both valence and arousal can be defined as subjective experiences (Russell, 1989). Valence is a subjective feeling of pleasantness or unpleasantness; arousal is a subjective state of feeling activated or deactivated. Recently, two dimensions have been proposed to reflect the degree to which different individuals incorporate subjective experiences of valence and arousal into their emotional experiences: valence focus and arousal focus (Feldman, 1995a). Valence focus is defined as the extent to which an individual incorporates pleasantness or unpleasantness into their conscious affective experience, and may be associated with a tendency to attend to the pleasant or unpleasant aspects of a stimulus. Arousal focus is defined as the extent to which an individual incorporates subjective experiences of arousal into a conscious affective experience, and may be associated with a tendency to attend to the internal sensations associated with an affective experience.[1] The present study provides further evidence that valence focus and arousal focus are important dimensions in describing how people label their own subjectively experienced affective states.

Discrete Emotions or Dimensions?

Valence focus and arousal focus have shed some light on the puzzle of the anxiety-depression relationship. Although researchers try to measure anxiety and depression as discrete entities, individuals differ in their tendency to distinguish between anxious and depressed moods. Previous research (Feldman, 1995a) has documented that valence focus and arousal focus are related to the correlation between ratings of anxious and depressed moods. Some individuals reported anxious moods whenever they reported depressed moods, and vice versa; these individuals were high in valence focus and low in arousal focus. Semantically, anxiety and depression denote a similar (negative) valence, but denote different levels of subjective arousal: anxiety denotes high levels of subjective arousal, whereas depression denotes low levels. Individuals who demonstrated strong positive correlations between ratings of anxious and depressed mood may not have been attending to their subjective feelings of arousal that would allow them to distinguish between

[1] Arousal focus likely involves attention to sensory information from either or both the autonomic and the somatic nervous systems, in addition to a tendency to attribute that information to emotional experience. Although arousal is not a unidimensional construct and likely consists of different patterns of activation across different systems (Blascovich, 1992), it is currently unclear whether it is necessary to specify which system the information is coming from. As a subjective feeling state, arousal may not be defined as any one physiological signal. In fact, the information that goes into the subjective feeling of arousal could come from any number of bodily sources, and probably comes from different sources for different people. The key to arousal focus is that whether individuals incorporate subjective perceptions of arousal into their emotion language, regardless of where perceptions of arousal originate from.

the two mood states. For other individuals, anxious and depressed moods were less correlated, or even uncorrelated. These individuals were more equal in their degree of valence focus and arousal focus, suggesting that they labelled their affective states based on the subjective feelings of both valence and arousal associated with momentary experience. The purpose of the present study is to demonstrate that semantic focus is not just related to respondents' tendency to report the co-occurrence of anxious and depressed moods, but is in fact related to their tendency to report the co-occurrence of emotions that are considered to be discrete and separate.

According to several theories, particular emotions like happiness, fear, sadness, hostility, guilt, surprise, and interest are considered discrete in that they are assumed to be unique experiential states that stem from distinct causes (e.g. Izard, 1977); some even consider these emotions to be "basic" (i.e. that they are present from birth and have distinct adaptive value: Izard, 1992; Stein & Oatley, 1992). Emotions should be experienced separately from one another for some proportion of the time to support the claim that they are discrete and experientially separate from one another. If some individuals experience strong degrees of co-occurrence between discrete emotional states, then this might indicate that those individuals do not meaningfully separate those emotions in conscious experience, and as a result would call into question that the subjective emotional states are indeed distinct for those individuals.

Extrapolating from the finding that individuals vary in the correlation between their anxious and depressed moods, and that the focus indices are related to the magnitude of this correlation, I hypothesised that individual differences in the co-occurrence of seemingly discrete emotional experiences exist, and that such differences can be captured by valence focus and arousal focus. Individuals who focus more on the valence of their experience than on their subjective arousal should evidence large positive correlations between subjective emotion states of the same valence because they are not attending to or incorporating the information that would distinguish the states from one another. At any given moment in time, if these individuals report experiencing one pleasant affect, they will report experiencing others; a similar scenario will occur for unpleasant affects. Individuals who attend more equally to valence and arousal information should label their subjective affective experiences in line with their arousal states and evidence smaller correlations between like-valenced affect states.

Overview of the Study

Valence focus was operationally defined as the degree to which individuals use the pleasantness or unpleasantness denoted by affect words when labelling their subjective emotional states. Arousal focus was similarly

defined as the degree to which individuals use the level of subjective arousal denoted by affect words when labelling their subjective emotional states. An experience-sampling procedure allowed for the construction of an affective structure for each participant (Feldman, 1995a). Measures of valence focus and arousal focus were obtained from each individual's affective structure and were used as input in between-subjects analyses to determine if valence focus and arousal focus provide an adequate description of individual differences in emotion co-occurrence. I hypothesised that increases in valence focus would be related to large correlations between like-valenced, subjective emotional states, whereas increases in arousal focus would be related to smaller correlations between those states.

METHOD

Participants

Sixteen male and 40 female students in the Department of Psychology at the Pennyslvania State University participated in a longitudinal study on the relationship between personality and the structure of affective experience. Participants received course credit and earned lottery tickets for their participation.[2]

The study began with 77 potential participants. Given the time-consuming nature of this study, the dropout rate among potential participants was fairly high. Sixteen participants (21% of the original sample) dropped out of the study of their own accord. Five more participants were deleted for making a large number of retrospective mood ratings (see below).

Procedure

At the beginning of the study, participants completed a battery of personality questionnaires, including a measure of their current affective state, and were then presented with instructions for the momentary emotion rating study. Participants completed an emotion questionnaire in the morning (7 a.m.–12p.m.), afternoon (12 p. m.–5 p. m.), and evening (5 pm.–12 a.m.) every day for 90 consecutive days. They returned completed forms on

[2] The data reported in this paper have been used to address questions about retrospective memory bias in emotion reports (Feldman Barrett, 1997) and the construct validity of the focus indices (Feldman, 1995c). The hypotheses tested and analyses covered in those reports do not overlap with those presented here. Only the materials relevant to this report will be presented here.

Monday, Wednesday, and Friday of each week. The experimenters contacted participants within 48 hours if they failed to return a questionnaire, and they interviewed participants three times during the study to ensure compliance with the research procedures. For 24 participants, the observation period was September through December 1993. For 32 participants, the observation period was January through April 1994. Some participants completed affect ratings on more days than were required, and these observations were included in the study. One day after participants completed the experience-sampling phase of the study, they met in several groups and completed a more general assessment of their emotional state. Only 52 subjects completed this final emotion measure.

After participants completed the study, the experimenters explained the purpose of the study and then asked a number of questions regarding participation. Participants estimated the percentage of time that they used recall to complete their questionnaires. Five participants (approximately 9% of the total sample) reported doing so more than 20% of the time and were deleted from the final sample. None of the 56 remaining participants missed more than 11.4% of the observations, and the average percentage of missed observations was 1.6%.

No participant reported awareness of the hypotheses under investigation. When we asked participants to describe their reactions to the momentary mood measurement, participants reported that they found the experience to be mildly to moderately time consuming, but not stressful. No participant reported that their participation in the study was significantly disruptive. Some valued the experience, whereas a few found it mildly aversive. Some participants reported that the study made them more aware of their emotions, but none reported that the study caused them to change how they labelled their experience.

Affective Experience Measure

The momentary emotion measure included 60 emotion terms taken from Positive Affect Negative Affect Schedule–Expanded Form (PANAS-X; Watson & Clark, 1994) as well as an additional 28 items from remaining octants of the affective circumplex (see Larsen & Diener, 1992). In the pre-sampling battery and in the experience-sampling portion of the study, participants indicated on a 7-point Likert scale the extent to which each adjective described their emotional state at that present moment (0 = not at all, 3 = a moderate amount, 6 = a great deal). When participants made general ratings of their emotional states at the end of the study, they used the 7-point Likert scale to indicate the extent to which each adjective described their feelings over the previous three months in general.

Octant Items. Sixteen affect-related terms represented the circumplex to ensure that all octants were equally represented. Two affect words were chosen for each octant (*enthusiastic*, *peppy*, *happy*, *satisfied*, *calm*, *relaxed*, *quiet*, *still*, *sleepy*, *sluggish*, *sad*, *disappointed*, *nervous*, *afraid*, *surprised*, *aroused*; Feldman, 1995b). Ratings of these words were used to construct valence focus and arousal focus indices.

Discrete Emotion Scales. Scales were constructed from the larger 88-item questionnaire to measure several discrete emotional states. Happy (*happy*, *delighted*, *joyful*, and *cheerful*) measuring happiness. Sadness (*sad*, *blue*, *downhearted*, *alone*, and *lonely*), measuring the emotion of the same name. Fear (*afraid*, *scared*, *frightened*, *nervous*, *jittery*, and *shaky*), measuring fear and anxiety. Hostility (*angry*, *hostile*, *irritable*, *scornful*, *disgusted*, and *loathing*), measuring anger. Guilt (*guilty*, *ashamed*, *blameworthy*, *angry at self*, *disgusted with self*, and *dissatisfied with self*), measuring the emotions guilt and shame. Although not typically considered a discrete emotion, I constructed a measure of Enthusiasm (*enthusiastic*, *excited*, *lively*, and *energetic*) in order to assess the co-occurrence of positively valenced subjective emotional states. The Sadness, Fear, Hostility, and Guilt scales were taken from the PANAS-X (Watson & Clark, 1994). The Happy and Enthusiastic scales together corresponded to the Jovial scale (*enthusiastic*, *excited*, *lively*, *energetic*, *happy*, *delighted*, *joyful*, and *cheerful*) of the PANAS-X.

Reduction of the Momentary Affect Data

Focus Indices. One correlation matrix, called a P-correlation matrix, was computed for each participant, containing correlations between the 16 circumplex markers across the experience-sampling period.[3] P-correlation matrices were analysed as described in Feldman (1995a) to yield two measures of valence focus and arousal focus.

The first set of focus indices was derived from a factor analysis of each participant's P-correlation matrix. Each P-correlation matrix was subjected to a principal axis factor analysis rotated to a target solution using an oblique Procrustes procedure in the Alberta General Factor Analysis Program (AGFAP; Bay, Hakstian, & Steiger, 1986). The first two unrotated factors were extracted from each P-correlation matrix and obliquely rotated to target circumplex criteria. The first factor was rotated to repre-

[3] Items with zero variance were removed from the P-matrices (Zevon & Tellegen, 1982). Item substitutions from the same octant were made only for the factor analyses to ensure a representative sampling of the affective domain.

sent the valence dimension and the second factor to represent the arousal dimension.[4] The factor structure for each participants' P-factors was compared to nomothetically derived valence and arousal factors (see Feldman, 1995b, Sample 3) using coefficients of congruence to verify the presence of the idiographic valence and arousal factors quantitatively. The statistical significance of Tucker's (1951) coefficient of congruence was determined for each factor using the sampling distributions constructed by Korth and Tucker (1975). Coefficients of congruence that were significantly different from those obtained from randomly generated factor matrices were determined by interpolation for the 16 variable, two-factor case (0.76 for the valence factor, 0.44 for the arousal factor, $P < .05$, two-tailed).

The coefficients of congruence between the nomothetic valence factor and the idiographic valence factors ranged from 0.67 to 0.98 with a mean of 0.93. The coefficients of congruence for the valence factor was below 0.76 for one participant (0.2% of the sample). This coefficient would be considered significant, however, according to the less stringent cut-off set by Cattell (1978). The coefficients of congruence between the nomothetic arousal factor and the second P-factor ranged between 0.10 and 0.91, with a mean of 0.68. Four participants had coefficients of congruence smaller than 0.44. Based on an inspection of the unrotated factor solutions, these four participants had the largest coefficient of congruence between the nomothetic arousal factor and the *third* unrotated P-factor. Only two factors had been extracted for Procrustes rotation, however. After removing these four participants from the analysis,[5] the coefficients of congruence between the nomothetic arousal factor and the idiographic arousal factors ranged from 0.56 to 0.91, with a mean of 0.71. Although these coefficients seem small, they are statistically different from those obtained by chance.

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[4] In previous research, the valence and arousal dimensions were the first and second unrotated factors extracted in analyses of mood data. When extracting unrotated factors, it is a mathematical necessity that the first factor will be larger than the second. This requirement does not exist when using a Procrustes rotation procedure, however. The target solution used in the present analysis was based on an ideal circumplex where the two factors are equal in size. Focus indices from the unrotated and the Procrustes factor solutions were highly related, however [for participants in Feldman (1995a), $r = .97$ and $r = .83$, for valence focus and arousal focus, respectively].

[5] Although the four participants in question did evidence an arousal factor, they were removed from the factor analyses because the rotation of a three factor model to a circumplex target matrix was not straightforward using an oblique Procrustes rotation; it was unclear how to deal with the extra (second) factor. None of the alternatives were optimal, and this may constitute a limitation of using the factor-based Focus indices. Semantic-based arousal focus scores were calculated for these participants, however.

Thus, the two factors rotated to Procrustes criteria produced valence and arousal dimensions in all but four participants. The percentage of total variance accounted for by an individual's valence factor was adopted as the factor-based index of that individual's valence focus. Similarly, the percentage of total variance accounted for by an individual's arousal factor was adopted as the factor-based index of that individual's arousal focus. The factor-based index of Arousal focus was not accurate for four participants (as noted earlier) and was not calculated for them. For the other 52 participants, the valence and arousal factors accounted for 27–58% of the variance in the mood ratings, with a mead of 41%, a finding that is consistent with previous idiographic studies of affective structure. The percentage of total variance accounted for by the valence factor ranged from 12% to 45%, with a mean of 24% and a standard deviation of eight. The percentage of total variance accounted for by the arousal factor and ranged from 9% to 28%, with a mean of 17% and a standard deviation of five. No sex differences were evident in either of these estimates.

The second set of indices was derived by comparing each P-correlation matrix to matrices representing the semantic structure of the affect terms. Each participant's P-correlation matrix was correlated with valence- and arousal-based semantic similarity matrices. Similarity matrices were obtained from a multidimensional scaling (MDS) of semantic similarity ratings of the circumplex terms as reported in Feldman (1995a). (Readers are directed to that paper for complete details regarding the derivation of the semantic-based indices of valence focus and arousal focus.) The second set of focus indices was calculated for all 56 participants. The valence and arousal semantic similarity matrices accounted for 42–74% of the variance in the mood ratings, with a mean of 59%. These figures are somewhat higher but still consistent with the percentage of variance in the affect ratings accounted for the valence and arousal factors. The correlations between participants' self-report correlation matrices and the valence-based semantic similarity matrix ranged from $r = .42$ to $r = .78$, with a mean of $r = .61$ and a standard deviation of 0.14. The correlations between participants' self-report correlation matrices and the arousal-based semantic similarity matrix ranged from $r = .00$ to $r = .56$, with a mean of $r = .31$ and a standard deviation of 0.14. No sex differences were evident in either of these estimates.

There was significant variation in the size of both the valence focus and the arousal focus indices. Consistent with the results reported in Feldman (1995a), valence focus was larger than arousal focus for the majority of participants. The semantic focus indices were compared for each participant using a normal curve test for correlated correlation coefficients (Meng, Rosenthal, & Rubin, 1992). Thirty-nine participants (70% of the sample) had a larger valence focus than arousal focus (statistically signifi-

cant difference at $P < .05$). Seventeen participants (30% of the sample) showed no significant difference between the magnitude of their valence focus and arousal focus.

Consistent with the results reported in Feldman (1995a), valence focus and arousal focus were negatively related to one another (correlations ranged from $-.27$ to $-.67$). The correlation remained significant even when correlating the factor-based valence focus estimate derived from the even days of the study with the semantic-based arousal focus estimate derived from the odd days of the study ($rs = -.48$). Thus, as valence focus increased, arousal focus decreased, although the correlation between the two was not large enough to consider the indices to be redundant.

Co-occurrence Indices. Co-occurrence between different affective experiences was indexed by the correlations between those experiences across time. Large correlations reflect large degrees of co-occurrence, and possibly little discrimination between affective states, whereas smaller correlations reflect smaller degrees of co-occurrence and more discrimination. Correlation coefficients were computed between all negative emotion scales from the PANAS-X across days (e.g. Sadness, Fear, Guilt, and Hostility). Fisher *r*- to *z*-transformations were performed on all correlations before additional analyses were completed. One set of correlations was computed and averaged for each participant. A similar procedure was followed for the positive emotion scales (Enthusiastic and Happy).

Affect Intensity. An intensity score was derived for each participant by taking the sum of pleasant emotions (Happy and Enthusiastic) for moments when positive affect was the dominant subjective state and of unpleasant emotions (Sadness, Fear, Hostility, and Guilt) on days when negative affect was the dominant state (e.g. Diener, Larsen, Levine, & Emmons, 1985; Larsen & Diener, 1987).

RESULTS

Psychometric Properties of Valence Focus and Arousal Focus

Two types of psychometric information are presented. First, stability estimates of the focus indices are presented to demonstrate that valence focus and arousal focus were reliably measured across the 90 days of the study. Second, the convergent validity of the focus indices is presented. These analyses take advantage of the longitudinal nature of the data to

demonstrate that the validity of valence focus and arousal focus was adequate when assessed across time.

Stability Estimates. Even/odd and first-half/second-half stability estimates for the valence focus and arousal focus indices are presented in Table 1. Four P-correlation matrices were constructed for each participant (one each for the even numbered days, the odd numbered days, the fist 45 days, and the last 45 days of the study) and were analysed to produce Valence focus and arousal focus indices. Consistent with findings from previous within-subject studies of emotion (see Epstein, 1983, p. 111), the even-odd stabilities were larger than the first-half/second-half stabilities. Stability coefficients tend to increase as the predictive interval increases, even when the number of days aggregated is the same. The difference in stability estimates was particularly pronounced for the arousal focus indices because the first-half/second-half stability estimates for both arousal focus indices were noticeably low.[6]

Convergent Validity. The focus indices were strongly related to one another. The correlation between the two indices of valence focus was acceptable ($r = .73$, $P < .01$), as was the correlation between the two indices of arousal focus ($r = .80$, $P < .01$), replicating the findings presented in Feldman (1995a). These validity estimates might be inflated because both sets of valence focus and arousal focus indices were derived from the same sample of data for each participant. To address this issue, I correlated the factor-based focus estimates for even days with the semantic-based focus estimates for odd days. The validity coefficients for valence focus and arousal focus were .66 and .65, $P < .01$, respectively, suggesting that the indices were moderately stable across even and odd days of the study. The factor-based valence focus index for the first 45 days was moderately stable when compared to the semantic-based valence focus index for the second 45 days, $r = .65$, $P < .01$. Arousal focus demonstrated weak validity when using the first half/second half comparisons, $r = .32$, $P < .05$. This low validity coefficient was related to the instability of the arousal focus indices across the first half of the study versus the second half of the study (see Table 1).

[6] Several analyses were conducted to explore the possibility that participants were changing their ratings style over time in consistent ways, producing the lower stability estimates for the arousal focus indices. No analysis proved informative, however. Individuals with temporally unstable valence focus indices were not the same participants who demonstrated instability on arousal focus. Furthermore, none of the personality variables measured in the present study differentiated between participants who demonstrated high temporal stability and those who demonstrated low temporal stability for any set of focus estimates.

TABLE 1
Stability Coefficients for the Focus Indices

	Valence Focus		*Arousal Focus*	
	Factor	*Semantic*	*Factor*	*Semantic*
Even/Odd	0.91	0.76	0.86	0.80
First-half/Second-half	0.74	0.70	0.35	0.58

Note: Stability estimates are reported for the circumplex items. Even/Odd = stability coefficients for even days vs. odd days of the study. First-half/Second-half = stability coefficients for the first 45 days of the study vs. the second 45 days of the study.

Co-occurrence of Experience-sampled Discrete Emotions

Researchers typically measure different affective states as discrete entities, and some believe them to be distinct and even innate or basic. In the present study, however, individuals differed in their tendency to report the co-occurrence of discrete emotions of the same valence. The average within-negative valence correlations (Sadness, Fear, Hostility, and Guilt) ranged across participants from .16 to .89 with a mean of 0.52 and a standard deviation of 0.24. The within-positive valence correlations (Enthusiastic and Happy) ranged from .51 to .96 with a mean of 0.77 and a standard deviation of 0.28. Individuals with large average correlations between negative affective states also evidenced large average correlations between positive affective states (r = .32, P < .05). Thus, individuals varied in the extent to which they reported the co-occurrence between, and possibly distinguished between, subjectively experienced affective states that typically considered to be distinct. Some individuals had small within-valence correlations, suggesting that they distinguished between like-valenced discrete emotions, whereas others had large within-valence correlations, suggesting that they did not distinguish between like-valenced emotions when reporting on their subjective experience.

As predicted, degrees of valence focus and arousal focus were associated with the co-occurrences of like-valenced emotions. The correlations between the focus indices and the co-occurrence indices are presented in Table 2. Increases in valence focus were associated with increased correlations between like-valenced emotions; most associations were large, positive, and significant. Thus, individuals who focused on the hedonics of their emotional experiences reported stronger co-occurrences between like-valenced discrete emotions than those focused less on hedonics. Increases in arousal focus were negatively associated with correlations between like-valenced emotions, although the factor-based index of arousal focus was

not associated with correlations between positively valenced states. Thus, individuals who focused on the subjective activation associated with their emotional experiences reported lower co-occurrences between like-valenced discrete emotions than those focused less on activation.

It might be argued that the relationships between the focus variables and the co-occurrence indices were inflated because all of the indices were derived from the same sample of data for each participant. In order to address this issue, I correlated the focus indices for even days with the mean correlations between positive affects and the mean correlations for negative affects calculated for odd days. The results were essentially identical to those reported earlier, and are reported in parentheses in Table 2. Furthermore, most of the emotion scales used in the co-occurrence analyses shared one or two terms with the circumplex markers that were used to produce the focus indices (out of the 31 scale items, 13% of them were circumplex markers). The results remained essentially the same as

TABLE 2
Relationship between Valence Focus, Arousal Focus, and Co-occurrences of Discrete Emotions

	Valence Focus		*Arousal Focus*	
	Factor	*Semantic*	*Factor*	*Semantic*
Sad-Fear	.56** (.43**)	.38** (.31*)	−.28* (−.30*)	−.51** (−.43**)
Sad-Hostility	.64** (.60**)	.45** (.37**)	−.18 (−.23)†	−.48** (−.39**)
Sad-Guilt	.68** (.58**)	.54** (.38**)	−.23† (−.34*)	−.53** (−.43**)
Fear-Hostility	.61** (.52**)	.46** (.47**)	−.17 (−.25)†	−.43** (−.44**)
Fear-Guilt	.56** (.47**)	.48** (.47**)	−.20 (−.28*)	−.44** (−.43**)
Hostility-Guilt	.48** (.46**)	.25† (.24)†	−.01 (−.05)	−.32* (−.32**)
Average Correlation for Negative Affective States	.71** (.65**)	.52** (.47**)	−.22† (−.35*)	−.55** (−.52**)
Correlation between Happy and Enthusiastic	.46** (.45**)	.55** (.50**)	−.03 (−.01)	−.25* (−.31*)

Note: $N = 56$ for all correlation except those involving the Factor Arousal Focus Index ($n = 52$). The numbers in parentheses are the correlations between the focus indices calculated for even days of the study and the like-valence and opposite-valence correlations calculated for odd days of the study.

†$P < .10$; * $P < .05$, 2-tailed; ** $P < .01$, 2-tailed.

those presented when the data were re-analysed after removing all item overlap from the scales.

An additional set of analyses was conducted to demonstrate that the focus indices captured something unique about discrete emotion co-occurrences that other summaries of momentary affective experience do not. Specifically, I compared the descriptive value of the focus indices to affective intensity. Affect intensity is defined as the characteristic intensity with which an individual experiences emotional states (Larsen & Diener, 1987). Individuals who tend to experience their emotions intensely had stronger correlations between like-valenced states than those who experience their emotions less intensely; increases in affective intensity were significantly related both to increased co-occurrences of positive emotional states ($r = .54$, $P < .01$), and to the average co-occurrences of negative emotional states ($r = .29$, $P < .05$). Furthermore, affect intensity was positively related to valence focus ($pr = .45$, $P < .01$ for the factor-based index, and $pr = .52$, $P < .01$ for the semantic-based index), but not to arousal focus ($prs = .00$ and $-.07$, respectively); the partial correlations reflect the relationship of one semantic focus index to affect intensity after controlling for the other semantic focus index.

It is possible that affect intensity might be directly associated with discrete emotion co-occurrences and that the relationship of valence focus to those co-occurrences was spurious. To assess this possibility, the zero-order correlations between valence focus and the emotion co-occurrence indices (i.e. the correlation between positive emotional states or the average correlation between negative emotional states) were decomposed using path analysis (Pedhauzer, 1982). I estimated: (1) affect intensity's direct effect on the emotion co-occurrence indices; (2) it's indirect effect through valence focus; and (3) the spurious effect of valence focus on emotion co-occurrences due to the influence of affect intensity. The path coefficients were the betas obtained from regression analyses. One set of regressions estimated the effects on the mean correlation between pleasant emotional states (Enthusiastic and Happy), and another set estimated the effects on the mean correlation between unpleasant emotional states (Sadness, Fear, Hostility, and Guilt). Analyses using the semantic-based focus indices are reported here. The results of analyses using the factor-based indices were highly similar to those reported and are available from the author on request.

The decompositions are presented in Table 3. According to the path models tested, the path between affect intensity and the valence focus was equal to their zero-order correlation. The direct effects were the betas between affect intensity and the co-occurrence indices, controlling for valence focus. As indicated in the fifth data row of Table 3, affect intensity did not have a direct effect on the co-occurrence of negatively valenced

emotions, but did have a direct effect on the co-occurrence of positively valenced emotions. The indirect effects were computed as the product of the zero-order correlation between affect intensity and valence focus and the beta relating valence focus to the co-occurrence indices, controlling for affect intensity. As indicated in the sixth data row of Table 3, indirect effects of affect intensity were large for both analyses. The spurious effects of valence focus were computed as the product of the zero-order correlation and the beta relating affect intensity to the co-occurrence, controlling for valence focus. As indicated in the eighth data row of Table 3, the effect of valence focus on the co-occurrences of negative emotional states was not spuriously due to affect intensity, but a spurious effect was apparent for the co-occurrence between positive states. Both direct effects of valence focus on the mean correlations were statistically significant ($P < .05$), however. Thus, valence focus continued to be related to discrete emotion co-occurrences over and above the influence of affect intensity, and the effect of valence focus on affective co-occurrences was not completely spurious. These results are striking, because both affect intensity index and the co-occurrence indices were calculated from *exactly* the same data points, whereas the focus indices were not. The results were essentially identical when the focus indices for even days and the co-occurrence indices for odd days were used in the analyses.

TABLE 3
Valence Focus and Arousal Focus as Moderators of Discrete Emotion Co-occurrences

	Co-occurrence	
Analysis	*Positive*	*Negative*
Zero-order Correlation		
AI–VF	.47**	.47**
AI–CORR	.54**	.29**
VF–CORR	.55**	.52**
Path		
AI–VF (direct effect)	.47**	.47**
AI–CORR (direct effect)	.32*	−.06
AI–VF–CORR (indirect effect of AI)	.16	.26
Unique influence of VF on CORR	.34**	.56**
VF–AI–CORR (spurious effect of VF)	.15	.03

Note: $N = 56$. AI = affect intensity; VF = valence focus; CORR = mean correlation between like-valenced emotional states.

*$P < .05$, 2-tailed; **$P < .01$, 2-tailed.

Co-occurrence of Cross-sectionally Sampled Discrete Emotions

Finally, valence focus and arousal focus were not just related to emotion co-occurrences in experience-sampling data (i.e. longitudinal assessments), but they were also related to the correlation between emotional states rated at one given point in time (i.e. cross-sectional assessments). Researchers often ask participants to rate their emotional state "right now, that is, at the present moment" representing a cross-sectional assessment of momentary emotional experience. Researchers also frequently ask participants to rate their emotional state "during the past month", "during the past year", or "in general, that is, on the average", representing a cross-sectional assessment of emotion that requires participants to remember, summarise, and integrate their past experiences into a consistent set of ratings. The final set of analyses tested the hypothesis that valence focus and arousal focus were related to the correlations between cross-sectional assessments of like-valenced states.

Participants made ratings of their current emotional state at the time they completed the pre-sampling battery, and they made retrospective ratings of their emotional experiences for the experience-sampling observation period. Discrete emotion scales were computed for each of these cross-sectional ratings. To demonstrate clearly the effect of semantic focus on the correlations between discrete emotion scales, individuals were categorised as high or low in valence focus and correlations between like-valenced emotions were computed within each group. A similar procedure was followed for arousal focus. A median split was performed on semantic focus indices to identify individuals who were high and low in valence focus ($M = 0.59$ vs. $M = 0.82$, $t = 11.1$, $P < .001$), and those who were high and low in arousal focus ($M = 0.21$ vs. $M = 0.43$, $t = 9.24$, $P < .001$). Correlations between like-valenced emotions scales are listed in Table 4. Valence focus was related to the magnitude of many correlations between the retrospective ratings of negative emotion and was marginally related to the average correlation between retrospectively generated negative emotional states. Valence focus was related to only two of the correlations between cross-sectional ratings of current negative emotion and was not significantly related to the average correlation. Arousal focus was primarily related to magnitude of the correlations between the current ratings of negative emotion, but was not related to the average correlation. Nor was it related to the magnitude of the correlations between recall-based ratings of negative emotion. Nonetheless, of the 24 correlations estimated between negative emotions, nine were statistically different from one another in the predicted direction (one or two would be significant by chance). Neither focus index was significantly related to the strength of

TABLE 4
Relationships between Focus Indices and Co-occurrence Cross-sectional Assessments of Emotion

	Valence Focus				*Arousal Focus*			
	Low	*High*	*z*	*P*	*Low*	*High*	*z*	*P*
Recall Emotion Ratings								
Sad-Fear	.25	.67**	1.9	.03	.56**	.74**	1.1	n.s.
Sad-Hostility	.53**	.79**	1.6	.05	.67**	.82**	1.2	n.s.
Sad-Guilt	.46*	.74**	1.6	.05	.70**	.67**	0.2	n.s.
Fear-Hostility	.41*	.54**	0.6	n.s.	.51**	.53**	0.1	n.s.
Fear-Guilt	.39	.78**	2.2	.02	.75**	.68**	0.5	n.s.
Hostility-Guilt	.73**	.80**	0.6	n.s.	.79**	.74**	0.4	n.s.
Average Negative	.48**	.73**	1.4	.10	.67**	.71**	0.2	n.s.
Happy-Enthusiastic	.82**	.78**	0.4	n.s.	.85**	.73**	1.1	n.s.
Current Emotion Ratings								
Sad-Fear	.13	.58**	1.9	.03	.62**	.12	2.1	.02
Sad-Hostility	.39*	.74**	1.9	.03	062**	.59**	0.2	n.s.
Sad-Guilt	.41*	.50**	0.4	n.s.	.43*	.68**	1.3	.10
Fear-Hostility	.50**	.66**	0.9	n.s.	.75**	.33	2.2	.02
Fear-Guilt	.51**	.59**	0.4	n.s.	.67**	.33	1.7	.05
Hostility-Guilt	.83**	.74**	0.8	n.s.	.74**	.85**	1.1	n.s.
Average Negative	.50**	.64**	0.8	n.s.	.65**	.53**	0.6	n.s.
Happy-Enthusiastic	.83**	.84**	0.1	n.s.	.84**	.82**	0.2	n.s.

Note: $N = 26$ for each group in the analyses of recall emotion ratings. $N = 28$ for each group in the analyses of current emotion ratings. Average Negative = average correlation between negative emotional states. Statistical tests are 1-tailed.

the relationship between happiness and enthusiasm. Thus, valence focus and arousal focus were related to the cross-sectional co-occurrences of negative subjective emotional states, although the relationships were not as robust as those seen in the longitudinal ratings.

DISCUSSION

The results of this study provide support for the hypothesis that valence focus and arousal focus are related to the co-occurrences of discrete emotional states in both longitudinal and cross-sectional measurements of emotion. Individuals high in valence focus and low in arousal focus reported more co-occurrence among like-valenced discrete emotions. These individuals likely experienced global pleasant or unpleasant states, with little differentiation between states. In contrast, individuals lower in valence focus and higher in arousal focus reported less co-occurrence

between like-valenced discrete emotions. For these individuals, the experience of one specific affective state at one moment did not necessarily indicate what other emotions were being experienced at that time.

Potential Limitations

Before considering the implications of these findings, a few potential limitations of the present research must be considered. One possibly problematic aspect of these results is the low stability estimates for indices of arousal focus across the length of the study. It is not clear from the present study why the indices used to measure arousal focus were unstable. Instability may be an inherent component of the construct if arousal focus is situationally influenced. Recent theories suggest that the perception of arousal cues is a function of the amount of internal stimulation relative to the amount of distracting external information (Blascovich, 1992; Carver & Scheier, 1981; Cioffi, 1991; Pennebaker, 1992), suggesting that arousal focus might fluctuate somewhat depending on the intensity of physiological cues or the salience of external cues. In addition, arousal focus might change systematically over time. There was no evidence that this occurred, however.

In addition, valence focus and arousal focus are negatively correlated, and some could argue that they contain redundant information. To justify the separation of valence focus and arousal focus as separate indices, it would be important to demonstrate their discriminant validity using exogenously measured personality variables. In a pilot study conducted on the present participants (Feldman, 1995c), valence focus and arousal focus demonstrated convergent and discriminant correlations to different sets of personality variables. Valence focus, but not arousal focus, was related to questionnaire measures of affect intensity and neuroticism, both of which may reflect emotional responsivity to the social environment. Arousal focus, but not valence focus, was related to questionnaire measures of self-awareness.

Implications of the Present Study

Beginning with the first investigations of emotion, researchers debated over whether a dimensional or a discrete approach to emotion theory was most appropriate. The findings presented here suggest that one theory may not apply to all people. Theories of discrete emotions may be most appropriate for individuals who focus both on pleasantness and on their level of subjective arousal when labelling their subjective emotional experiences, because these individuals report less frequent co-occurrences between emotions of the same hedonic tone. In contrast, dimensional theories

may best capture the affective experience of individuals who focus mainly on the pleasantness or unpleasantness of their subjective emotional experiences, because they report strong co-occurrences between emotions of the same hedonic tone. The large correlations between subjective emotional states of similar valence may indicate that these individuals are reporting several affective states together, or it may indicate that they are not distinguishing between what are typically considered to be distinct states. Although this study does not support either interpretation specifically, it does present a certain challenge to researchers who focus their research efforts on discrete emotions while using self-report inventories.

It is likely a matter of debate whether the present findings are applicable to the structure of consciously constructed subjective emotional experience, or to the structure of emotions as biological entities. Theorists who take a social constructivist approach do not distinguish between the two levels: From their perspective, these findings indicate that emotions are discrete entities for some individuals more so than for others. In contrast, however, many contemporary theorists make a distinction between the conscious labelling of emotional experience and the biological responses that underlie that experience. From their perspective, these findings say little about the structure of emotional responses *per se* because subjective experience represents only the translation of biological phenomena into a conscious representation. So from that perspective, valence focus and arousal focus reflect individual differences in the translation process. An interesting line for future research would be to investigate whether some individuals show evidence of discrete emotional responses (using other indicators of emotional response such as facial expressions, autonomic activity, etc.), even though their subjective emotional experiences remain relatively undifferentiated. Of course, this type of investigation requires clear markers of discrete emotion responses; whether such markers exist is, in itself, a matter for considerable debate (see for example, Cacioppo, Klein, Bernston, & Hatfield, 1993; Ekman, 1994; Russell, 1991, 1994, 1995). Although the results of the present study do not resolve this level-of-analysis issue, they do suggest that it may be misleading to treat self-reports of sadness, fear, anger, and the like, as discrete entities in the face of evidence that some individuals do not report them as discrete.

Furthermore, researchers have argued that discrete emotions have distinct adaptive value. The findings of the present study suggest that the adaptive consequences associated with the use of discrete emotions labels may be more relevant for some individuals than for others. A major function of discrete emotions, whether they are biologically distinct entities or socially constructed labels applied to undifferentiated biological signals, is to change the relationship between an individual and his/her environment (Campos, Campos, & Barrett, 1989; Lewis, 1993). Discrete

emotion concepts and their associated labels can be viewed as representational scripts (Russell, 1991) that influence an individual's: (1) understanding of his/her immediate surroundings; (2) social communication of the experience to others; and (3) behavioural repertoire. Individuals who can distinctly apply a discrete emotion lable to their experience can avail themselves of the motivation and the behavioural repertoire (Fridja, 1993) to cope with the stimulus event that they believed caused their emotional experience. Individuals who do not use emotion labels in a distinct fashion (i.e. whose labelling appears more dimensional), may not enjoy the adaptive advantages that discrete labels confer.

Moreover, it may be more important to understand the process of arriving at an emotional experience than to measure how much of a given emotion people report (i.e. high vs. low). For example, previous research on emotion has debated whether evaluative or physiological information is more important to the core of an emotional experience. One static, nomothetic theory of affective experience may not be accurate for everyone, however. The findings of the present research are consistent with hypothesis that individuals vary in the type of information that they attend to when labelling their own emotional experiences.

Finally, the present study suggests that different individuals may use the same self-report labels in different ways. Individuals high in valence focus seem to use affect labels to communicate the general hedonics of their experience, whereas those higher in arousal focus use the labels to communicate specific affective states. Given these individual differences, it may be less tenable to compare all individuals to one group mean as is done in the typical cross-sectional study of specific emotions. The same emotion word can be used to communicate different experiences by different people. At this stage, assessing valence focus and arousal focus is an arduous task. Researchers may not feel that the investment of time and resources necessary to measure valence focus and arousal focus is justified. Ignoring the observation that individuals differ in discrete emotion co-occurrence, however, may prove even more problematic for measuring subjective affective experience.

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