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Individual Difference Variables, Affective Differentiation, and the Structures of Affect

Antonio Terracciano, Robert R. McCrae, Dirk Hagemann, and Paul T. Costa Jr.

National Institute on Aging, NIH, Department of Health and Human Services

Abstract

Methodological arguments are usually invoked to explain variations in the structure of affect. Using self-rated affect from Italian samples ($N = 600$), we show that individual difference variables related to affective differentiation can moderate the observed structure. Indices of circumplexity (Browne, 1992) and congruence coefficients to the hypothesized target were used to quantify the observed structures. Results did not support the circumplex model as a universal structure. A circular structure with axes of activation and valence was approximated only among more affectively differentiated groups: students and respondents with high scores on Openness to Feelings and measures of negative emotionality. A different structure, with unipolar Positive Affect and Negative Affect factors, was observed among adults and respondents with low Openness to Feelings and negative emotionality. The observed structure of affect will depend in part on the nature of the sample studied.

The structure of affect has been extensively studied, but theoretical controversies and empirical inconsistencies remain. In this article we will argue that no single model of the structure of affect can be correct, because different people experience and report affect differently. Individual difference variables that influence affective differentiation moderate the observed structure of affect terms.

Elucidating the structure of affect is important for understanding and measuring affective domains. Although many issues related to the structure of affect are controversial, one point of agreement is that two dimensions can parsimoniously describe affective experiences (e.g., Russell, 1980; Watson & Tellegen, 1985; but see Schimmack & Grob, 2000). One-factor solutions appear to be oversimplifications that do not take into account important aspects of core affect, and that explain significantly less variance than two-factor solutions (Diener, Smith, & Fujita, 1995). Three or more factors, by contrast, are not parsimonious and explain little additional variance. With self-rated affect, two dimensions consistently emerge as major factors across many cultures, different descriptor sets, time frames, response formats, and within- and between-subjects designs (Barrett & Russell, 1999; Watson, 1988; Watson & Clark, 1997). In addition, the two-dimensional framework appears consistent with the existence of more discrete emotions. Many researchers (Church, Katigbak, Reyes, & Jensen, 1999; Diener et al., 1995; Russell & Barrett, 1999; Tellegen, Watson, & Clark, 1999) have proposed

Address correspondence to Antonio Terracciano, Laboratory of Personality & Cognition, National Institute on Aging, NIH, 251 Bayview BLVD, Baltimore, MD 21224. E-mail: TerraccianoA@grc.nia.nih.gov.

Antonio Terracciano, Robert R. McCrae, Dirk Hagemann, and Paul T. Costa, Jr., Laboratory of Personality and Cognition, National Institute on Aging, National Institutes of Health, Baltimore.

Dirk Hagemann is now at the Department of Psychology, Universität Trier, Trier, Germany.

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that the two broad dimensions are hierarchically related to specific emotions such as surprise and joy.

Within the two-factor perspective, two rotational variants have been considered in factor analyses of self-reported affect. Usually the first unrotated factor is interpreted as a Valence dimension--pleasant versus unpleasant--and the second unrotated factor as an Activation or Arousal dimension--activated versus deactivated--(Larsen & Diener, 1992; Russell, 1980). From the varimax-rotated solutions, the first factor is usually interpreted as Positive Activation and the second as Negative Activation¹ (Watson, Clark, & Tellegen, 1988; Watson, Wiese, Vaidya, & Tellegen, 1999). There is considerable debate over whether the unrotated or the rotated solutions provide the more basic dimensions of affect (e.g., Larsen & Diener, 1992). However, the dispute appears less important if the two dimensions are considered as the orthogonal axes of a circular structure in a two-dimensional space. In fact, in a circular structure in which affect descriptors are evenly arranged around the perimeter of a circle, the axes are interchangeable and the orthogonal pairs Valence-Arousal and Positive Activation-Negative Activation are simply 45° rotations of one another (Yik, Russell, & Barrett, 1999).

The circular pattern has been elaborated upon by Russell (1980) and is one of the most extensively studied representations of affect. Russell provided a descriptive definition of the circular model of affect as a “spatial model in which affective concepts fall in a circle in the following order: pleasure (0°), excitement (45°), arousal (90°), distress (135°), displeasure (180°), depression (225°), sleepiness (270°), and relaxation (315°)” (Russell, 1980, p. 1161; for similar structures see Watson & Tellegen, 1985; Yik et al., 1999). Approximations to the circular structure of affect have been extracted from judgments of the similarity between pairs of mood terms (e.g., Russell, 1980), from judgments of facially expressed emotion (e.g., Russell & Bullock, 1985), and from self-reported mood (Yik et al., 1999). In addition, some studies suggest that the circular pattern generalizes to children (Russell & Ridgeway, 1983) and to cultures and languages other than North American (Russell, Lewicka, & Niit, 1989).

There is, however, dispute about how well affective data can be described by a circular structure. Watson et al. (1999) have argued that the schematic circular structure fails to capture the complexity of empirical data and that “all of the major alternative versions of this circular structure fail to meet generally accepted standards for goodness of fit” (Watson & Tellegen, 1999, p. 608). Remington, Fabrigar, and Visserand (2000), in a reanalysis of previous studies using a covariance structure model specifically designed to assess circumplex structure (Browne, 1992), found substantial variability in the goodness of model fit across studies.

In the present study, we will explore whether the circular structure emerges from affect rating in Italian samples. We will use affect descriptors that represent each of the octants of the circumplex model. Note that it is likely that different structures would emerge from different sampling of affect descriptors. However, using the same set of affect markers we will test the circumplex model in several groups, exploring whether individual differences variables are related to variations in the circular structure of affect.

Group Differences and the Structure of Affect

Inconsistency in the structure of affect across studies is often attributed to methodological problems related to random and systematic measurement errors, sampling of affective terms, or single- versus multi-methods approaches (Barrett & Russell, 1998; Remington et al., 2000; but see Watson & Clark, 1997; Schimmack, Böckenholt, & Reisenzein, 2002). In the

¹Positive Activation and Negative Activation are the labels that Watson and colleagues (Watson et al., 1999) have recently used to emphasize the activation component in their Positive Affect and Negative Affect dimensions.

present study we explore possible alternatives to these methodological explanations for the contradictory findings in the field.

One promising alternative is that individual differences contribute to the variability in the two-dimensional structure of affect.² Using a within-subjects design, Feldman (1995a;1995b) observed substantial differences in the structure of affect across subjects. People weigh the valence and the arousal dimensions differently in judgments of affective experience. In fact, Feldman noted that an elliptical structure typically emerged from self-report mood due to the common tendency to emphasize the valence dimension and ignore differences in the degree of activation among affective terms. These differences in individuals' attention to the hedonic and activation components are captured by two new constructs: valence focus and arousal focus (Feldman, 1995a;Feldman, 1995b). Valence focus was defined as the tendency to attend to and report the pleasant or unpleasant aspects of emotional experiences; an index of valence focus was the variance explained by the first factor extracted from a series of repeated self-rated affects. Arousal focus was defined as the tendency to attend to and report the subjective level of arousal of emotional experiences. An index of arousal focus was the variance explained by the second factor.

Unlike Feldman, who used a within-subjects design, we will employ a between-subjects design in which the structure of affect is examined in contrasted groups (cf. Bagozzi, Wong, & Yi, 1999; Reich, Zautra, & Potter, 2001; Zautra, Reich, Davis, Potter, & Nicolson, 2000). These groups are hypothesized to differ in the way in which their members differentiate among emotional states, so the group analyses indirectly reflect the processing of affective information in individuals.

How do variations in experiencing and reporting affect translate into different structures of affect? We argue that almost everyone distinguishes between positive and negative affect terms, but that there are differences in the ability to differentiate feelings in terms of arousal within the categories of pleasant and unpleasant affect. Individuals high in affective differentiation can distinguish between anxiety and depression and between contentment and excitement, and when their data are factored, a circumplex structure should result. However, other people might be less able to distinguish among forms of positive or negative affect that differ in arousal level. Thus, if they report being very anxious, they will also tend to report being very depressed; if they say they are moderately content, they will also say they are moderately excited.

What structure should be expected when data from a group of such less differentiated raters are analyzed? Based on the work of Feldman, one might hypothesize that a single bipolar valence factor would be found. But Feldman's design examined state affect within individuals, and such designs often yield bipolar positive vs. negative affect factors (Feldman, 1995a). When trait affect is examined in between-subject designs, positive and negative affect are usually independent factors (Diener & Emmons, 1984). In the present study, at least in the analysis of trait affect data, we would expect that data from undifferentiated raters would yield two independent unipolar factors defined by tight clusters of positive and negative affects. In the present study, we investigate the influence of personality traits and other variables on affective differentiation as reflected in the structure of self-reported affect.

²Wessman and Ricks (1966) and more recently Larsen and Culter (1996) observed individual differences in the structural complexity of affect. They assessed the structural complexity as the number of within subject factors needed to account for a given amount of variance in each subjects' daily mood ratings. In contrast, we focus on the variation in the two-dimensional structure.

Student vs. Adult Samples

Most studies of the structure of affect have been conducted in student samples (e.g., Barrett, 1998; Fisher, Heise, Bohrnstedt, & Lucke, 1985; Lorr, Shi, & Youniss, 1989; Meyer & Shack, 1989; Russell, 1980; Rusting & Larsen, 1995; Yik et al., 1999). Most of these studies have found some support for the hypothesized circular structure, although some have not (e.g., Watson et al., 1999). Less is known about the structure of affect in adult samples. We expect students to differentiate affects in their self-reports more than do members of the general population. Students are likely to have a wider range of intellectual interests, and they may be more introspective and concerned with their emotional life because they are at a developmental stage when self-discovery and identity are major issues (Constantinople, 1969). Furthermore, our sample was composed in part of students training to become psychologists, who may be particularly psychologically-minded and perhaps more able to differentiate among psychological constructs.

Personality Traits

From the Five-Factor Model (FFM) perspective, a reasonable hypothesis is that Openness to Experience is associated with affective differentiation. In the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992; McCrae, 2001), the facet O3: Openness to Feelings assesses individual differences in attentiveness to inner feelings and affective experiences: “High scorers experience deeper and more differentiated emotional states” (Costa & McCrae, 1992, p. 17). O3 is composed of items like “I experience a wide range of emotions or feelings” and reversed items like “I rarely experience strong emotions.” Several studies by Matsumoto et al. (2000; see also Terracciano, Merritt, Zonderman, & Evans, 2002) have shown that Openness is significantly correlated with the recognition of emotional expression in faces. We test the hypothesis that subjects with high scores on O3 report a wider range of emotions and discriminate affective terms more acutely than subjects with low scores on O3 do. Because they presumably attend to both valence and arousal, affect data from open subjects should more likely generate a circular structure than affect data from closed subjects.

The personality factor most strongly related to the emotions and affect in general is Neuroticism, also called Emotional Instability or Emotionality. This factor assesses individual differences in the tendency to experience negative affect. It is plausible that persons with low levels of Neuroticism (who are usually calm, even-tempered, emotionally stable) will show less differentiation among affective experiences compared to persons with high levels of Neuroticism, and thus are less likely to yield a circular structure of affect. By contrast, we expect a more circular structure with clear differences among the distinct affect markers from people with a high level of emotionality: People who have had extensive personal experience with dejection, dread, and rage should be able to distinguish among such emotions in terms of arousal as well as valence. Furthermore, research on depression has shown that negative affect is associated with rumination (Lyubomirsky & Nolen-Hoeksema, 1993). Individuals high in Neuroticism might dwell on their dysphoric feelings, and, in the process, gain insight into the nuances of their emotional life. We will test this hypothesis with the NEO-PI-R Neuroticism scale and attempt to replicate with the Negative Affect scale (Watson et al., 1988), which has been shown to be strongly related to Neuroticism (Watson & Clark, 1992).³

Sex Differences

Sex is another variable that may influence the structure of affect. Sex differences have been observed in many aspects of affective life, including the intensity of emotional experiences

³Like individuals high in Neuroticism, people high in Extraversion (especially the Positive Emotions facet) and Positive Affect have more and more intense emotional experience, and might be expected to show greater affective differentiation. In preliminary analyses, these groups did show a more circular structure in one trait and both state analyses.

(e.g., Diener, Sandvik, & Larsen, 1985; Hagemann et al., 1999) and the capacity to detect and express emotions. For example, women discriminate facial expression more accurately, and they are also more expressive (Buck, Savin, Miller, & Caul, 1972; Cozby, 1973; Schwartz, Brown, & Ahern, 1980; Terracciano et al., 2002). Thayer and Johnsen (2000) reported that in judgments of facially expressed emotions, female responses showed a more complex structure based on valence and arousal dimensions, whereas male responses produced only a valence dimension. In addition, a recent investigation demonstrated that “women consistently displayed more complexity and differentiation in their articulations of emotional experiences than did men” (Barrett, Lane, Sechrest, & Schwartz, 2000, p.1027). Although women are consistently found to be more accurate in the discrimination of emotions, sex differences in the structure of affect are not usually reported. We examine sex differences in the structure of affect, and hypothesize that women will show a more circular and differentiated structure than men.

State vs. Trait Time Frame

Although the focus of this paper is on sample differences rather than methodological differences, we do examine one variation in methodology that could contribute to the variability in the structure of affect: the time frame. In some studies participants reported their current affect, whereas in other studies they reported their affect over an extended period of time. Some researchers have argued that this can influence the structure of self-reported affect. Indeed, Diener and Emmons (1984) found “the relation between positive and negative affect differed greatly depending on the time frame” (p. 1105). However, Watson et al. (1988) found that time frame did not influence the correlation between the Positive and Negative Affect scales. Contrasting results emerged also from studies that investigated the full structure of self-reported affect. Meyer and Shack (1989) examined whether the octal placement of mood terms was differentially affected by trait and state ratings and found that “a fairly high degree of octal correspondence was observed across state and trait time frames” (p. 697), with only a few terms (such as fatigue), showing small differences between the circular structure of both time frames. However, Remington et al. (2000), using the program CIRCUM, analyzed published data sets and found a weak tendency for fit (to a circumplex model) to be better for state than trait ratings (p. 291). We will investigate state and trait ratings, providing a contribution to this complex issue.

Evaluating Circumplex Structures

To examine these hypotheses, quantitative methods are needed to test whether empirical data conform to circumplex structure. Several methods are utilized to evaluate circular structure (Fabrigar, Visser, & Browne, 1997), but the more common have the limitation of being essentially descriptive. To provide a quantifiable method for assessing circumplex structure, Browne (1992) has proposed a covariance structural modeling approach, implemented by the program CIRCUM, which offers maximum likelihood estimates of parameters and goodness-of-fit indices. This is a sophisticated and appealing statistical approach, but its applicability to the study of affective structure is questionable.

The unconstrained CIRCUM model follows a mathematical definition in which “circumplex structure merely implies that the strength of associations or the strength and direction of associations among variables should be a function of the distance between variables on the circumference of the circle” (Fabrigar et al., 1997, p. 187). Following this assumption it is not required that variables be equally spaced around the circumference of the circle or even that they follow the theoretically dictated order. In contrast, the circular model of affect (Russell, 1980) is essentially defined by the position of the octant components. For example, the model predicts that Pleasant is the opposite of Unpleasant, that Activated is the opposite of Deactivated, and that Activated and Pleasant are 90° apart. Using unconstrained CIRCUM

analyses, any spacing or ordering of the variables around the circumference would give a good fit, if the estimated locations reproduced the observed correlations well. In principle, one could achieve a good fit with all 8 variables within a 10° arc, or if Pleasant were 45° from Unpleasant and 180° from Activated, or if Pleasant were located between Unpleasant and Unpleasant Activated. Thus, the unconstrained CIRCUM analyses do not consider an essential conceptual assumption: Circular representation precludes variables from clustering into distinct groups (Fabrigar et al., 1997, p. 185; Larsen & Diener, 1992).

It is possible to use CIRCUM to test models in which variables are constrained to be equally spaced around the circumference. However, previous studies suggest that empirical data rarely achieve a good fit when the model is constrained. The work of Fabrigar et al. (1997) is a good example. They reanalyzed empirical data that appeared to show a very good circular structure (see Fabrigar et al., 1997, pp. 194–198), but when the variables were constrained to be equally spaced, CIRCUM provided a Root Mean Squared Error of Approximation (RMSEA) of .11, which indicates unacceptable fit. Preliminary analysis of the data in the present study also suggested that results from CIRCUM did not square with visual inspection of the two-dimensional plots: Structures that looked like circles showed fit statistics almost as bad as structures that bore no resemblance to circles.

To avoid these discrepancies we adopted an alternative strategy to assess the circumplexity of the empirical structure, based on congruence coefficients: We perform a principal component analysis of the affect data, extract two factors, and rotate them to best fit the target structure specified by Russell (1980). It is then possible to calculate the Tucker's congruence coefficient between the observed data and the target for the total structure (McCrae, Zonderman, Bond, Costa, & Paunonen, 1996) that represents the fit of the empirical data to the theoretical structure.

The purpose of using statistical indices is to provide an objective and quantitative measure of the extent to which empirical data are consistent with the hypothesized structure. Ideally, such indices would reflect the similarity of the data to a circumplex *gestalt* as judged by experts or by a consensus of human judges. To assess the validity of the CIRCUM fit statistics and our congruence coefficients we asked experts in circumplex models and 8 additional psychologists to evaluate each empirical structure. These analyses provide a basis for selecting a measure of circularity in affect structures.

The current study

In brief, we will investigate the structure of affect in Italian samples. We will conduct principal components analyses of self-reported affect to examine whether the affective descriptors approximate a circular structure. Furthermore, personality traits, sex, and sample characteristics (student vs. adult samples) are hypothesized to be associated with affective differentiation and thus to contribute to the variability in the structure of trait and state affect. To our knowledge, this is the first study of the relation between personality traits and the circumplexity of the structure of affect, and the first study of the dimensional structure of affect in Italian samples.

Method

Participants

A student sample ($n = 249$, age range: 18–37, $M = 21.5$, $SD = 3.6$; 65.9% women) was recruited from the faculty of medicine and biology at the University of Naples and from the faculty of psychology at the University of Trieste. In Italy, a university education ends in a doctoral degree, so these participants might be more comparable to American graduate students than

American undergraduates. An adult sample ($n = 351$, age range: 18–87, $M = 32.5$, $SD = 10.2$; 60.7% women) was recruited from South and North Italy with a snowball strategy: Initial subjects asked other persons (relatives, friends, partners, and acquaintances) to take part in a psychological study by completing questionnaires at home and recruiting further participants. The combined sample consisted of 600 participants (age: $M = 27.9$, $SD = 9.78$; 62.9% women). Participants were volunteers with an average to high level of education.

Measures

Affect scales—Using terms from the schematic model presented by Russell and Carroll (1999) and from Yik et al. (1999) as guidelines, we selected 2 or 3 items for each octant to sample systematically and completely each region of the circular structure of affect. Specifically, for the 8 octant-scales we selected: alert (allerta), hyperactive (iperattivo), and surprised (sorpreso) for Activated; ebullient (esuberante), enthusiastic (entusiasta), and excited (eccitato) for Pleasant Activated; content (contento), delighted (lieto), and happy (felice) for Pleasant; calm (calmo), relaxed (rilassato), and serene (sereno) for Pleasant Deactivated; quiet (quieto), and tranquil (tranquillo) for Deactivated; bored (annoiato), and tired (stanco) for Unpleasant Deactivated; discontent (scontento), unhappy (infelice), and sad (triste) for Unpleasant; nervous (nervoso), jittery (agitato), and upset (turbato) for Unpleasant Activated.

The items described were administrated as a part of a list of 52 adjectives with state and trait formats (see below). This list also contained adjectives from the PANAS scale (Watson et al., 1988; Terracciano, McCrae, & Costa, in press), and items representing the ten basic emotions studied by Izard (1977).

The first author, a native Italian speaker, completed the translation of the 52 terms. Bilinguals blind to the content of the original English words performed back translations. The results of the back translation were virtually identical to the original English version. On the combined sample with the trait format, the internal consistency reliabilities (Cronbach's coefficient alpha) were .32 and .46 for Activated and Unpleasant Deactivated scales, respectively, suggesting the need for caution in interpreting those scales, but ranged from .69 to .82 for the other 6 scales. With the state format, the alphas were .42 and .47 for Activated and Unpleasant Deactivated scales, but ranged from .66 to .87 for the other 6 scales. PANAS Positive Affect and Negative Affect scales were also scored from the adjectives, and showed alphas of .83 and .87, respectively with the trait format, and .83 and .85 with the state format. The octant scales Pleasant Activated and Unpleasant Activated were strongly correlated with PANAS Positive Affect and Negative Affect scales (.72 and .89, respectively with the trait format, and .76 and .91 with the state format).

The Revised NEO Personality Inventory—The NEO-PI-R (Costa & McCrae, 1992) is a 240-item questionnaire that assesses the basic dimensions of the Five-Factor Model (FFM; McCrae & John, 1992) of personality: Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A), and Conscientiousness (C). Eight-item scales are used to measure six specific traits or facets for each of the five factors. Items are answered on a 5-point Likert scale ranging from strongly disagree to strongly agree, and scales are balanced to control for the effects of acquiescence.

Five hundred seventy five participants completed the Italian version of the NEO-PI-R translated by Caprara and Barbaranelli (Caprara, Barbaranelli, Hahn, & Comrey, 2001; McCrae et al., 1999), slightly modified by the first author (Terracciano, 2001) with the addition of 23 alternative translations of items that showed poor psychometric properties in the previous study (McCrae et al., 1999). For this analysis we replaced 8 of the Caprara and Barbaranelli items with the alternative items that improved the psychometric properties of the facet scales. The

structure of this revised Italian version of the NEO-PI-R was examined in the combined sample. For the five domain scales, the Cronbach alphas were 0.91, 0.88, 0.87, 0.86, and 0.91 for N, E, O, A, and C, respectively. These values are as high as the corresponding values for the original scales (0.92, 0.89, 0.87, 0.86, and 0.90, respectively; Costa & McCrae, 1992, Table 5). The O3 facet internal consistency was 0.64 (0.66 in the American normative sample). Congruence coefficients comparing the Italian factors with American normative factors ranged from .96 to .98 after orthogonal Procrustes rotation (McCrae et al., 1996), and all 30 facets loaded chiefly on the intended factor. Thus, the Italian version of the NEO-PI-R closely replicates the American normative structure (Terracciano, 2001).

Procedure

Volunteers signed a consent form, reported their address if they were interested in feedback concerning the personality profile, provided background information, and then completed questionnaires at home. They rated on a 5-point scale the extent to which they had experienced each affect term with respect to trait and state formats. First, participants were asked to report the intensity (from slightly or not at all to extremely) of their current affect, how they were feeling “right now”, which is intended to assess state affect. Later, they were asked to report the frequency (from never to always) of their affect over an extended period of time, how they felt “in general”, which was intended to assess trait affect. Between the two measures, subjects filled out the Italian version of the NEO-PI-R.

Analyses

The basic analyses considered the two-dimensional structure of affect variables within groups defined by our hypotheses: Students vs. adults, high versus low scorers on O3, N, and Negative Affect, and women vs. men. We used an extreme groups strategy to investigate the effects of personality traits on the structure of affect, using the upper and lower 27% of the distributions (Feldt, 1961; Fowler, 1992). (Similar results were obtained using alternative cut-off scores, e.g., ± 1 SD). These criteria yield two groups of 162 subjects with extreme scores from the combined sample of 600 subjects.⁴ Considering the level of communality of the 8 octant scales (about .6) and the level of overdetermination (variable to factor ratio = 8:2), this sample size should yield stable factor solutions (MacCallum, Widaman, Zhang, & Hong, 1999). Thus, the samples sizes appear generally to be adequate.

Evaluating circumplexity—We used Browne’s (1992) CIRCUM, a covariance structure modeling program, to evaluate circumplexity. In our analyses, Activation was designated as the reference variable. We ran the analyses under two conditions, with and without the constraint that the variables must be equally spaced. The communality estimates of all variables were left free to vary. No constraints were placed on the minimum common score correlation. One free parameter was specified in the correlation function equation; additional free parameters did not improve the model fit. The final model without any constraints had a total of 24 free parameters and 12 degrees of freedom. The model with the constraint of equal space among variables had a total of 17 free parameters and 19 degrees of freedom. The model was fit using the method of maximum likelihood. All others specific control codes for the CIRCUM satellite routines were specified as recommended for routine use. In line with common practice we used the χ^2 statistic and RMSEA as fit indices.

Targeted rotation and congruence coefficients—To test whether the affect scales are systematically arranged around the perimeter of a circular structure, two principal components were extracted in each sample, and orthogonal Procrustes rotation (Schönemann, 1966) was

⁴We calculated *ns* for the extreme groups on the basis of the full sample size. However, only 575 participants had NEO-PI-R; thus, the extreme groups based on NEO-PI-R variables were actually the upper and lower 28% of the sample.

used to orient each solution to best match the circular target. The target matrix to which each solution was rotated was a circular structure where Activation loaded 0 on the first factor and +1 on the second factor; Pleasant Activated loaded +.71 and +.71 (because .71 is the cosine of 45°); Pleasant loaded +1 and 0; Pleasant Deactivated loaded +.71 and −.71; Deactivated loaded 0 and −1; Unpleasant Deactivated loaded −.71 and −.71; Unpleasant loaded −1 and 0; and Unpleasant Activated loaded −.71 and +.71. Procrustes rotation does not affect the relative positions of the variables in the two-dimensional plane, but it provides a common orientation for all solutions, and makes it possible to quantify fit to the hypothesized circular structure through the calculation of congruence coefficients for the total solution and each of the variables (McCrae et al., 1996; see also Rusting & Larsen, 1995). These congruence coefficients are analogous to the familiar factor congruence coefficients (Wrigley & Neuhaus, 1955), calculated over the total factor matrix or individual rows instead of columns. There are no generally recognized rules-of-thumb for interpreting total or variable congruence coefficients, but factor congruence coefficients greater than .85 (Haven and ten Berge, 1977) or .90 (Barrett, 1986; McCrae et al., 1996; Mulaik, 1972) are typically considered evidence of factor replication. Congruence coefficients are used here to quantify visual inspection and as a convenient way to summarize and compare fit to the circular structure in multiple subsamples.

Expert and consensus judgments—Finally, we used human judgments of circumplexity. For each structure,⁵ we plotted the loadings of the eight variables (labeled only as 1 to 8) from the targeted rotations, presented them in random order to judges, and asked them to evaluate their circumplexity on a scale of 1 to 10. Judges were shown the plot of the target matrix and instructed that a score of 10 should be assigned to an ideal circular structure “in which the points are equally spaced around a circle in the center of the figure and follow in order from 1 to 8.” Judges were blind to all fit indices and congruence coefficients. To obtain expert ratings, we asked J. S. Wiggins and K. K. Trobst, who are known for their work on circumplex structures (e.g., Wiggins & Trobst, 1997), to evaluate the structures. We also obtained ratings from 8 psychologists. Agreement among raters was very high: Cronbach alpha for the 8 psychologists was .97. The correlation between the ratings of the experts and the consensus judgments of the psychologists was .92 ($p < .01$).

Results

Indices of Circumplexity

To evaluate the indices of circumplexity we correlated them with expert and consensus judgments (see Table 1). It is evident that the total congruence coefficient measures the characteristics that human judges consider essential elements of the hypothesized circular structure. By contrast, the fit indexes estimated by CIRCUM⁶ show low correlations with the judgments (although all are negative, as they should be). CIRCUM appears to assess characteristics of the correlation matrix that are not necessarily relevant to the evaluation of the theoretically and empirically based model of affect. On these bases, we choose to rely exclusively on congruence coefficients in our subsequent analyses.

Trait Affect Structure

A principal components analysis was performed on the octant scales in the full sample. The first two unrotated factors accounted for about 40% and 22% of the total variance of the trait ratings, and 44% and 21% of the total variance of the state ratings. Consistent with the literature, extracting additional factors contributed little to explained variance.

⁵The evaluations were conducted on structures from 32 groups examined in preliminary analyses.

⁶Goodness-of-fit indices are available upon request from the authors.

Student vs. adult—The Procrustes-rotated loadings for the student and adult samples are plotted in Figures 1a-b.⁷ It is apparent that neither sample fully matched the ideal circular structure of affect: As in previous studies (e.g., Watson et al., 1999), affect descriptors selected to represent each of the circumplex octants failed to reproduce the theoretical structure. However, comparing the two samples, it is evident that the students approximated a circular structure much more closely than the non-students. We found two broad and orthogonal clusters in the adult sample, suggesting that they did not clearly discriminate among the affective words with different degree of activation. The covariation between affects of the same hedonic tone is most notable for affects with negative valence; Unpleasant Deactivated, Unpleasant, and Unpleasant Activated scales produce a close cluster, leaving large gaps in the lower region of the two-dimensional space. Furthermore, with different degrees but in both samples, both the Activation and Deactivation octants appeared to have positive rather than neutral valence. In contrast, in both samples subjects clearly discriminate between pleasant and unpleasant affect terms.

Quantitative measures of fit (congruence coefficients) are reported in Table 2. The total congruence coefficients clearly reflect the differences between plots of the two samples, with students achieving higher congruence coefficients. By Haven and ten Berge's rule-of-thumb (.85), the students reach an acceptable fit (.88). Of interest, analyses within a sub-sample of psychology students ($n = 87$) showed the best approximation to the affect circumplex, with a very high congruence coefficient (.96). This pattern is consistent with the hypothesis that these individuals are higher in psychological-mindedness and better able to differentiate affects.

Congruence values for each octant are also reported in Table 2. In both samples, congruence coefficients were excellent for Pleasant Activated and Unpleasant Activated. Pleasant Deactivated, Deactivated, and Unpleasant Deactivated octants showed very poor fit in the adult sample. Thus, the quantitative data confirm that it is the lower portion of the circular structure that fails to represent a universal component of the structure of affect. These results are probably not due to the internal consistencies of the octant scales: Although Unpleasant Deactivated had a low alpha (.46), Deactivated did not (.77), and Activated, which had the lowest alpha (.32), showed good congruence coefficients.

Personality groups—The Procrustes-rotated loadings for the groups with the lowest and highest scores on O3: Openness to Feelings are plotted in Figures 2a-b. Two broad and orthogonal clusters emerged from the group of subjects with low scores on O3, but a more circular structure emerged from the group with high scores on O3 facet. Figures 3a-b present plots for groups with the lowest and highest scorers on N, and Figures 4a-b present plots for Negative Affect. The loadings plots clearly indicate strong contrasts between the extreme groups on N and Negative Affect. Consistent with hypotheses, a circular structure is easily identifiable in the trait ratings of subjects with high levels of emotionality. By contrast, the plots of subjects with low levels of emotionality show two tight clusters resembling simple structure.

The structures in Figures 2a, 3a, and 4a are clearly not Russell's circumplex. Although the horizontal axis could be interpreted as Valence, the vertical axis is not the Activation dimension of Russell's circumplex, because all Deactivated scales have positive rather than negative loadings on that factor. Attenuation of the Activation dimension, however, does not reduce the structure to a one-dimensional Valence factor. Instead, the structures in Figures 2a, 3a, and 4a are better described by two orthogonal unipolar dimensions that can be interpreted as Positive and Negative Affect. This is illustrated in Figure 5, in which the data from Figure 4a are shown.

⁷In all Figures, the axes are labeled Activation and Valence, which characterize the Russell model and the ideal target matrix. In some Figures, these labels may not accurately characterize the observed data.

These findings suggest that some respondents do not differentiate between levels of activation, especially in regard to negative affects, but all distinguish independent positive and negative affects.

Quantitative measures of fit for the extreme groups are reported in Table 2. The total congruence coefficients reflect the differences between plots of the extreme groups, with more open and emotional groups achieving high congruence coefficients. By Haven and ten Berge's rule-of-thumb (.85), the groups high on O3, N, and Negative Affect reach an acceptable fit.⁸

Sampling error—One eminent advantage of the CIRCUM approach is that it allows a rigorous statistical test (χ^2 , p-value) to infer the probability that the discrepancy between the empirical structure of one group of participants and the mathematical model is due to sampling error (chance). No such test is available for the coefficient of congruence. To compensate for this disadvantage, we conducted a simulation study to yield information about the probability that the observed coefficients of congruence are due to chance. In an informal Monte Carlo approach, we analyzed the distribution of congruence coefficients from 200 subsamples ($n = 162$) selected randomly from the general sample. The congruence coefficients from the random subsamples ranged from .55 to .90 ($M = .685$; $SD = .066$). We found that 95% of these random subsamples showed a congruence coefficient below .80. Thus, sampling errors apparently do not explain the effects observed for the extreme high groups on O3, N, and NA.

Sex differences—Contrary to expectations, as can be seen in Figures 6a-b and reported in Table 2, there was no appreciable difference in the structure of trait affect between women and men. In these analyses, the hypothesized superiority of women in differentiation of affect was not confirmed.

In summary, approximations to the conceptual circular structure of affect were found in student more than the adult sample, and in groups higher on Openness to Feeling, Neuroticism, and Negative Affect but not in the groups low in these dimensions. The differences among our groups reflect the inconsistent findings reported in literature. This study, however, has the advantage of using an identical methodology across samples, and thus allows us to conclude that the differences are not due to different methodological biases.⁹

State Affect Structure—Consistent with trait rating data, the student sample shows a higher congruence coefficient than the adult sample (Figure 7a-b), but neither sample yields a perfect circumplex model. As in trait data, the state ratings of the groups high on O3 (Figure 8a-b), and Negative Affect (Fig. 10a-b) showed a more nearly circular structure in state ratings than the groups low on these dimensions. The high and low N groups produced nearly identical structures, and the congruence coefficient for the high N group did not meet Haven and ten Berge's (1977) .85 rule-of-thumb for factor replication (see Table 3). When women were compared with men (Figure 11a-b), the congruence coefficient was somewhat better for women (.84) than for men (.71), although less than .85.¹⁰

⁸We considered the possibility that correlations among independent variables might have resulted in redundancy of the results reported. In particular, the finding that O3, N, and Negative Affect extreme groups show a better circumplex structure may be due to a higher percentage of psychology students in these groups. We therefore examined the percentage of the psychology students in the extreme personality groups, but found little evidence of systematic overlap.

⁹Additionally, the structural differences observed in the subsamples and the extreme groups reported in both trait and state data do not seem to be explained by skewed distributions or patterns of restricted variance among variables. Factor analyses of the rank-order correlations among the eight scales (which eliminate the impact of skewness and kurtosis; see Gorsuch, 1983) showed virtually identical results. Furthermore, no consistent associations were found between variation in the range of variance of the 8 affect scales and approximation to circular structure.

¹⁰To explore for possible moderating effects across the full FFM, additional analysis examined the effects of A and C on the structure of affect, although no hypotheses were formulated. No differences were found between the extreme groups of A or C in the structure of trait affect. Groups high in A and C showed a slightly more circular structure of state affect than groups low in A and C.

For state affect, as for trait affect, octant congruence coefficients showed best fit for Pleasant Activated and Unpleasant Activated octants whether or not a circular structure was found, and worst fit for Deactivated and Unpleasant Deactivated octants. Again, Activated and Deactivated octants showed a positive rather than neutral valence, and in some groups, the octants with negative valence form a tight cluster, creating large gap where the octants with low activation were expected.

Sampling error—As with the trait time frame, we analyzed the distribution of congruence coefficients in state affect data from 200 subsamples ($n = 162$) selected randomly from the general sample. Congruence coefficients ranged from .72 to .87 ($M = .793$; $SD = .032$). We found that 95% of the distribution of these random subsamples showed a congruence coefficient below .84. Thus, the extreme groups high on O3 and NA showed congruence coefficients higher than 95% of randomly selected groups.

State vs. Trait

A comparison of Tables 2 and 3 shows that differences between contrasted groups appear somewhat reduced in the state data, but the pattern remains the same. Indeed, the correlation between the state and trait total congruence coefficients was .76 ($N = 10$; $p < .05$), supporting our findings as replicable across state and trait ratings. The consistency of results is particularly noteworthy in light of the different process and biases involved with the two formats. Indeed, Robinson & Clore (2002) argued that the state format relies on episodic emotion knowledge, whereas the trait format relies essentially on semantic type of knowledge.

The state format data showed a somewhat better fit to the circular structure of affect than did the trait data. The total congruence coefficient for the combined sample was .80 (Table 3) with the state time frame and .68 (Table 2) with trait time frame. A better fit for the state ratings is consistent with some studies (Remington et al., 2000; see also Diener & Emmons, 1984) but not with others (e.g., Meyer & Shack, 1989). As argued by Remington et al. (2000), the interdependence among affective state becomes less strong over an extended period of time, explaining the tendency of state ratings to show better circular structure. Although it is unlikely that people will feel happy and angry at the same time (but see Larsen, McGraw, & Cacioppo, 2001) over an extended period of time people may experience both affects.

Discussion

In summary, we found weak support for the circumplex model and a marked variability in the structure of affect: People conceive and experience—or at least report—affective experiences in different manners. For some people the classic circular structure based on two bipolar dimensions is a good representation; these people tend to be attentive to their feelings and high in temperamental emotionality. For others, distinctions related to activation level are attenuated, and two unipolar dimensions suffice to describe affect.¹¹

We found different structures of affect among selected groups despite the use of the same instrument and methods. Many researchers (e.g., Yik et al., 1999) have argued that when methodological problems (like measurement errors and incomplete sampling of mood descriptors) are taken into account a circular structure emerges. Others (e.g., Watson, et al., 1999) have found evidence that even after methodological problems are controlled, a circular structure is not an adequate picture of the underlying structure of affect. The present study

¹¹The present study does not address whether less differentiated individuals are capable of distinguishing specific emotions (such as contempt and disgust) on the basis of features other than activation.

demonstrated that personality traits and sample characteristics can moderate the structure of affect and may explain some of the discrepancies between previous studies.

It is unlikely that the variability in the structure of affect observed in the present study is a culture-specific phenomenon, characteristic only of these Italian samples. In fact, these results are consistent with previous findings on American samples that described divergence in the circular structure of affect (Feldman, 1995a; 1995b). The present study represents an extension of Feldman's pioneering work in other two aspects. First, we used an easily-replicated between-subjects design, whereas Feldman used a more difficult and time-consuming within-subjects design. Second, we related the variations we found to individual difference variables, such as Openness to Feelings, that are correlates and perhaps sources of these differences.

An interesting question remains

Would within-subject analyses of open and emotional people be more likely to show a circular structure and an arousal focus than analyses of closed and unemotional people? A preliminary answer to this question comes from the work of Barrett, who found that open, introspective people did show a more prototypical circular affect structure (L. F. Barrett, personal communication, April 9, 2001).

In addition, it would be interesting to explore to what extent other variables influence affective differentiation and the structure of affect. Verbal ability or level of education could have an effect on the ability to identify emotions with appropriate words. People with extensive vocabularies might be better able to discriminate among affect terms, providing a more accurate description of their emotions. However, supplementary analysis examining factor structure in lower and higher education groups showed that the level of education did not seem to influence the structure of affect in the present sample. Another variable worth considering is emotional intelligence, a type of social intelligence that involves the ability to perceive one's own and other's emotions, to discriminate among them, and to use this information to guide one's thinking and actions (Mayer, Dipaolo, & Salovey, 1990). Accurate appraisal of emotions is the component of emotional intelligence that could influence the structure of affect. Furthermore, the structure of affect might be distorted and impoverished in subjects with alexithymia (Wise, Mann, & Shay, 1992), an affective and cognitive disturbance characterized by impaired fantasy life and an inability to verbalize or differentiate emotions.

The concepts of emotional intelligence and alexithymia are relevant if variations in affective differentiation are due to differences in the ability to perceive or verbalize affective states. An alternative possibility is that some people simply lack the motivation to make fine discriminations. For example, closed individuals might not be sufficiently interested in their inner feelings--or in the rating task--to attend carefully to subtle differences among positive and negative states. An experimental design, in which participants are motivated by external incentives, might show that they are capable of making these distinctions when motivated to do so. Further, the influence of individual differences variables on the ability to differentiate emotions could be tested with different experimental designs. For example, physiological data from functional brain imaging (e.g., Canli et al., 2001) or cardiovascular responses (e.g., Neumann & Waldstein, 2001) could explore whether individuals with poor affective differentiation respond at a physiological level to differences in arousal, even if they are not fully conscious of these differences. Exploring alternative approaches to assessing affective differentiation, in particular at the individual level, could allow a more direct test of the above hypothesis.

Quantifying Circumplexity

Quantitative methods for assessing the circumplexity of structures are essential. Browne's CIRCUM is certainly a welcome development in this regard, but, like other structural modeling techniques (McCrae et al., 1996), it does not always provide the most intuitively satisfying results. As ten Berge (2000) has recently noted, "applied psychologists, facing 'improved' psychometric methods, are well advised to demand empirical evidence for the alleged superiority of the innovations" (p. 139). In the present article we provide some empirical evidence on correspondence between CIRCUM fit indices and expert and consensus judgments of the circumplex gestalt. At least by this criterion, CIRCUM does not perform well. By contrast, total congruence coefficients after Procrustes rotation correspond almost perfectly to human judgments.

It must be recalled, however, that congruence coefficients are essentially measures of effect size, not statistical significance. New methods for evaluating significance are needed, perhaps based on a bootstrap procedure (cf. Chan, Ho, Leung, Chan, & Yung, 1999). In the meantime, experience with this method in other research on circumplex structures may yield serviceable rules-of-thumb for interpreting congruence coefficients.

The Structures of Affect

The findings presented here suggest that a circular schematic representation of the structure of affect is appropriate in some groups of subjects, but not in others. As in previous studies "the data suggest a model that falls somewhere between classic simple structure and a true circumplex" (p. 820; Watson et al., 1999). Most important, the present findings suggest that there is no single, universal structure of affect.

The circumplex and simple structures we have discussed are ideal models that are not perfectly exemplified in any of our subsamples. Even in groups hypothesized to be more affectively differentiated, the arousal axis is less evident than the valence axis.¹² Conversely, in the groups hypothesized to be less differentiated, perfect simple structure was not observed.

These lapses from perfect conformity to the ideal may indicate deficiencies in the models, but more probably they reflect the fact that affective differentiation is almost certainly a continuous variable. People whom we have designated as "less differentiated" probably make distinctions between some states, or on some occasions; people we call "more differentiated" may occasionally fail to note differences in arousal level. The two models do not apply to two distinct classes of people, but to two forms of affective differentiation that may both operate in the same individual.

Both of these forms of differentiation result in two-dimensional representations, but it is important to recognize that they are not defined by the same dimensions. It is not the case that the same affects are located in different portions of the same two-dimensional plane in these alternative structures; instead, the two models refer to two different planes. Simple structure occurs when distinctions between high and low arousal are minimized; the axes of this plane are unipolar dimensions of Positive Affect and Negative Affect. This solution is consistent with the model proposed by Watson, Clark, and Tellegen (1984) and Watson and Tellegen (1985). By contrast, circumplex structure occurs when differences in arousal level are taken

¹²It is not surprising that the problems are generally associated with the arousal axis. Some authors (Schimmack & Grob, 2000; Watson et al., 1999) have argued that there is little support for the existence of an independent general activation dimension (orthogonal to the valence dimension), and it is difficult to find words that describe or measure it directly, at least in English and Italian. Furthermore, a well-supported neuropsychological model of emotion posits that "arousal is not viewed here as having a separate substrate, but rather as representing intensity of activation (metabolic and neural) of either the appetitive or aversive system, or the coactivation of both systems (see also Cacioppo & Bernston, 1994)" (Lang, Bradley, & Cuthbert, 1998, p. 397).

into account, leading to bipolar axes of Positive and Negative Activation (or Valence and Activation). In any set of real data, the observed structure is some conflation of these two planes.

Conclusion

Recent debates on the structure of affect have focused on the effects of measurement methodology. The lesson of the present study is that researchers must also attend to individual differences in subjects and samples. The strength of the present study is that a single method was used, so variations in structure cannot be attributed to method. However, the use of a single method is also a limitation, because the same results might not be seen with different methods. Clearly, future research needs to attend to both methods of measurement and characteristics of the persons measured.

If we assume that the simple and circular structures we have found accurately represent the different affective experiences of individuals, there are profound implications for the study of affect. Phenomenologically, some people--those who are open to experience and highly emotional--have more differentiated feelings and make a wider range of distinctions among the affective states they experience. Other people have a simpler emotional world, adequately characterized by the degree to which they experience positive and negative affect. Different theories are likely to be needed to explain emotional processes in these different groups, and different assessment instruments or strategies will be optimal.

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Figure 1a-b

Figure 1.

Figure 1a–b. Plot of factor loadings for the eight trait scales after Procrustes rotation in student and adult samples. A = Activated; PA = Pleasant Activated; P = Pleasant; PD = Pleasant Deactivated; D = Deactivated; UD = Unpleasant Deactivated; U = Unpleasant; UA = Unpleasant Activated; cc = Total congruence coefficient.

Figure 2a-b

Figure 2.

Figure 2a–b. Plot of factor loadings for the eight trait scales after Procrustes rotation in extreme groups on Openness to Feelings (O3). See Figure 1 for abbreviations.

Figure 3a-b

Figure 3.

Figure 3a–b. Plot of factor loadings for the eight trait scales after Procrustes rotation in extreme groups on Neuroticism (N). See Figure 1 for abbreviations.

Figure 4a-b

Figure 4.

Figure 4a–b. Plot of factor loadings for the eight trait scales after Procrustes rotation in extreme groups on Negative Affect (NA). See Figure 1 for abbreviations.

Figure 5.

The position of Positive and Negative Affect factors in a plot of factor loadings for the eight trait scales in the low Negative Affect group (Figure 4a). See Figure 1 for abbreviations.

Figure 6a-b

Figure 6.

Figure 6a–b. Plot of factor loadings for the eight trait scales after Procrustes rotation in men and women. See Figure 1 for abbreviations.

Figure 7a-b

Figure 7.

Figure 7a–b. Plot of factor loadings for the eight state scales after Procrustes rotation in student and adult samples. See Figure 1 for abbreviations.

Figure 8a-b

Figure 8.

Figure 8a–b. Plot of factor loadings for the eight state scales after Procrustes rotation in extreme groups on Openness to Feelings (O3). See Figure 1 for abbreviations.

Figure 9a-b

Figure 9.

Figure 9a–b. Plot of factor loadings for the eight state scales after Procrustes rotation in extreme groups on Neuroticism (N). See Figure 1 for abbreviations.

Figure 10a-b

Figure 10.

Figure 10a–b. Plot of factor loadings for the eight state scales after Procrustes rotation in extreme groups on Negative Affect (NA). See Figure 1 for abbreviations.

Figure 11a-b

Figure 11.

Figure 11a–b. Plot of factor loadings for the eight state scales after Procrustes rotation in men and women samples.

Table 1

Correlations among measure of circumplexity.

	1	2	3	4	5	6	7
1. Expert judgments	--						
2. Consensus judgments		.92**					
3. Total congruence coefficient			.96**				
4. CIRCUM fit indices			.93**				
5. RMSEA (variables equally spaced)			--				
6. χ^2 (variables equally spaced)							
7. RMSEA (spacing unconstrained)							
8. χ^2 (spacing unconstrained)							
9. Expert judgments							
10. Consensus judgments							
11. Total congruence coefficient							
12. CIRCUM fit indices							
13. RMSEA (variables equally spaced)							
14. χ^2 (variables equally spaced)							
15. RMSEA (spacing unconstrained)							
16. χ^2 (spacing unconstrained)							

Note. N = 32 structures. RMSEA = Root Mean Squared Error of Approximation.

*
p < .05.

**
p < .01.

Table 2
Total and variable (octant) congruence coefficients across selected groups for trait affect ratings

	Total	A	PA	P	PD	D	UD	U	UA
High O3	0.86	0.90	0.99	0.96	0.92	0.59	0.51	0.90	1.00
Low O3	0.60	0.91	1.00	0.94	0.64	-0.16	-0.27	0.79	0.99
High N	0.88	0.91	1.00	0.98	0.92	0.66	0.78	0.93	0.93
Low N	0.59	0.95	1.00	0.89	0.62	-0.26	-0.25	0.69	0.98
High Negative Affect	0.91	0.81	0.93	1.00	0.99	0.81	0.99	0.98	1.00
Low Negative Affect	0.49	0.73	1.00	0.85	0.30	-0.70	-0.18	0.81	1.00
Women	0.66	0.93	1.00	0.93	0.63	-0.18	-0.11	0.77	1.00
Men	0.68	0.94	1.00	0.96	0.74	-0.06	-0.07	0.82	1.00
Student	0.88	0.90	1.00	0.98	0.92	0.67	0.61	0.93	1.00
Adult	0.65	0.96	1.00	.94	0.70	-0.14	-0.16	0.79	1.00
Combined sample	0.68	0.93	1.00	0.94	0.71	-0.03	-0.09	0.78	1.00

Note: A = Activated; PA = Pleasant Activated; P = Pleasant; PD = Pleasant Deactivated; D = Deactivated; UD = Unpleasant Deactivated; U = Unpleasant; UA = Unpleasant Activated; O3 = Openness to Feelings and N = Neuroticism.

Table 3
Total and variable (octant) congruence coefficients across selected groups for state affect ratings

	Total	A	PA	P	PD	D	UD	U	UA
High O3	0.90	0.95	0.99	0.98	0.97	0.65	0.68	0.97	1.00
Low O3	0.72	0.99	1.00	0.98	0.83	0.08	-0.07	0.80	0.99
High N	0.82	0.97	0.99	0.97	0.88	0.31	0.36	0.90	0.98
Low N	0.78	0.96	1.00	0.95	0.90	0.30	0.01	0.80	1.00
High Negative Affect	0.86	0.95	1.00	0.98	0.92	0.52	0.56	0.91	0.99
Low Negative Affect	0.72	0.92	1.00	0.93	0.89	0.21	-0.43	0.85	0.97
Women	0.84	0.96	1.00	0.97	0.92	0.47	0.35	0.91	0.99
Men	0.71	0.96	1.00	0.96	0.82	-0.05	0.04	0.82	1.00
Student	0.86	0.97	1.00	0.97	0.94	0.49	0.49	0.92	1.00
Adult	0.75	0.95	1.00	0.96	0.85	0.20	0.01	0.84	0.99
Combined sample	0.80	0.96	1.00	0.96	0.89	0.30	0.18	0.87	1.00

Note: A = Activated; PA = Pleasant Activated; P = Pleasant; PD = Pleasant Deactivated; D = Deactivated; UD = Unpleasant Deactivated; U = Unpleasant; UA = Unpleasant Activated; O3 = Openness to Feelings and N = Neuroticism.