Journal of Personality and Social Psychology
1989, Vol. 57, No. 4, 691–706

0022-3514/89/$00.75

Structural Convergence of Mood and Personality: Evidence for Old and New Directions

Gregory J. Meyer and John R. Shack
Loyola University of Chicago

Using factor analytic techniques, extensively researched 2-dimensional models of mood structure (Watson & Tellegen, 1985) and personality structure (H. J. Eysenck & Eysenck, 1985) were examined for their degree of convergence. As hypothesized, it was shown that extraversion and positive affect share a common dimension in combined mood–personality space and that neuroticism and negative affect together define the 2nd dimension of this space. Significantly, this finding held whether mood was assessed as a state or a trait. The circumplex structure of trait and state mood was also assessed, providing strong support for most octants of the Watson and Tellegen model. Finally, scales of state mood, trait mood, and personality were assessed and differentiated according to theoretical expectations. Implications for research based on a unified map of the 2-dimensional personality–mood space were elucidated.

In recent years a consensus has formed that a two-dimensional structure adequately describes self-rated affect at its broadest level (Diener, Larsen, Levine, & Emmons, 1985; Larsen & Diener, 1985; Russell, 1978, 1979; Watson, Clark, & Tellegen, 1984; Watson & Tellegen, 1985; Zevon & Tellegen, 1982). In a similar fashion, within the study of personality there is agreement on (at least) a two-dimensional structure that adequately describes "normal" personality in its broadest representation (H. J. Eysenck, 1981; H. J. Eysenck & Eysenck, 1985; Gray, 1972, 1981).

The central questions that are addressed in this article are (a) Is there a meaningful and stable structure of individual differences that characterizes both mood and personality at their most general level? and (b) if there is a structure common to both mood and personality, what are the manifest differences across these domains?

Previous research (Costa & McCrae, 1980, 1984; Emmons & Diener, 1986; Warr, Barter, & Brownbridge, 1983) has demonstrated that there is a consistent relation between mood factors and personality factors. However, the observed degree of association has typically only been moderate, with correlations ranging from .2 to .4. These findings do not suggest a shared mood–personality structure. However, Watson and Clark (1984) and Meites, Lovallo, and Pishkin (1980) have shown that personality measures of neuroticism converge so strongly with various affect measures of anxiety and depression that they must be considered manifestations of a single underlying dimension—termed *negative affectivity* by Watson and Clark. We seek to extend this latter finding by demonstrating convergence across two dimensions, rather than across a single dimension. Furthermore, we intend to demonstrate this convergence across broad-based models of affect and personality, not simply across disparate measures within these two domains. The distinction between *measures* and *models* is a salient one. Taken alone, measures of a factor or a dimension do not imply a level of analysis or a positioning within a broader conceptual scheme. In contrast, the two-dimensional models that are compared in this study are firmly grounded in organized conceptual frameworks and have empirical foundations that demonstrate that the respective structures operate at the broadest and most comprehensive level for describing variation. Therefore, if it can be shown that these models share a common structural base, further validity will be provided for the comprehensiveness of each model, and an important link can be drawn between the study of personality and the study of affect.[1]

Rotational Confusion

Both mood and personality researchers have had similar disagreements over the proper rotation of factors within two-dimensional space. It has been noted (e.g., Watson et al., 1984) that in a two-dimensional factor analytic solution there is not an a priori correct position for the dominant dimensions. Theoretically, orthogonal dimensions could be placed at any position within this space. Because this is the case, the worth of one solution over another must be demonstrated by the significant pat-

This research is based on Gregory J. Meyer's master's thesis. We would like to extend special thanks to James Johnson, Dan McAdams, David Watson, and three anonymous reviewers for their helpful comments on drafts of this article.

Correspondence concerning this article should be addressed to Gregory J. Meyer, Department of Psychology, Loyola University of Chicago, 6525 North Sheridan Road, Chicago, Illinois 60626.

[1] Tellegen (1985) has reported that one explicit goal in the development of his Differential Personality Questionnaire was to generate mood scales that paralleled the personality dimensions of extraversion and neuroticism. He has also reported (Watson & Tellegen, 1985) that there is a high degree of correlation between these mood and personality dimensions, but data on this concordance have not, to our knowledge, yet been published.

tern of relations that are found with a particular two-dimensional solution.

This indeterminancy appears to be much like the confusion early geographic cartographers would have faced had they not had knowledge of magnetism. In this situation it would have been agreed that the Earth could usefully be conceptualized on a two-dimensional plane. Without benefit of a compass, however, there would have been considerable disagreement as to what the essential or basic coordinates to this two-dimensional space should be. Fortunately, it was discovered that magnetized steel would point north when suspended freely. This fact was used to define the salient north–south dimension and the east–west dimension orthogonal to it. Unfortunately, in the fields of mood and personality, there is no readily apparent objective criteria (e.g., magnetized steel) that can be used in determining the primary coordinates in two-dimensional mood or personality space.

Despite this, the salience, replicability, and experimental support for a particular set of dimensions can be used as the criteria for *selecting* an agreed-on basic structure. We believe that the organization that would flow from the selection of basic dimensions would be very effective in bringing a rejuvenated focus to mood and personality research. With these considerations in mind, we present a model of mood and a model of personality that we believe currently represent the primary coordinates of two-dimensional space. In the process, alternative rotations within each domain are discussed briefly.

Mood Models

Watson and Tellegen (1985) and their colleagues have conducted the most comprehensive review and analysis of mood structure to date. Their own research as well as their review and reanalysis of previously published mood research resulted in the model presented in Figure 1. In their reanalysis of previous studies, Watson and Tellegen found that despite different pools of mood terms and different rating formats, the same two dimensions of mood consistently emerged. Figure 1 presents the basic dimensions of this mood structure.

In this model, positive affect (PA) and negative affect (NA) are independent orthogonal dimensions that emerge in factor analysis after a varimax rotation. These two dimensions (irrespective of the exact mood terms used) consistently account for one half to three fourths of the common variance between emotional terms in factor analytic solutions. In contrast, a third dimension typically accounts for less than 10% of the common variance (Watson & Tellegen, 1985). Dominant dimensions of PA and NA have been found across cultures (Watson et al., 1984), in both idiographic and nomothetic factor analytic solutions (Zevon & Tellegen, 1982), across rated time frames and response formats (Watson, 1988b), and in reanalyzed solutions that had previously argued for the existence of multiple discrete emotional factors (Watson & Tellegen, 1985). Additionally, PA and NA have shown differential relations to a variety of daily activities and health complaints (Clark & Watson, 1988; Watson, 1988a). Finally, the broad dimensions of PA and NA have been found as the varimax-rotated second-order dimensions for discrete emotional factors, indicating that these dimensions are complementary (not contradictory) and hierarchically related to discrete emotional theories (e.g., Izard, 1977; see Watson & Tellegen, 1985).

One prominent alternative to the Watson and Tellegen (1985) solution is a model proposed by Russell (1978, 1979; Russell & Ridgeway, 1983) that argues that the two dominant mood dimensions are "degree of arousal" and "pleasantness–unpleasantness." Watson and Tellegen contended that Russell's dimensions will emerge in an unrotated factor analytic solution, or alternatively, that these dimensions can be seen by noting the affect terms that load highly on both the PA and the NA dimensions. In Figure 1, degree of arousal (engagement–disengagement) and pleasantness–unpleasantness are depicted at a 45° rotation to the dimensions of PA and NA.

Diener and his colleagues (Diener et al., 1985; Larsen & Diener, 1985) have proposed two affect dimensions, intensity and hedonic level, that are similar to the dimensions proposed by Russell (1978, 1979; Russell & Ridgeway, 1983). Intensity is described as the degree to which an emotion is experienced, regardless of its positive or negative valence. It has been found that individuals vary consistently with regard to how activated (intense) their emotions are, and it appears that the intensity dimension is basically describing the engagement (arousal) dimension depicted in Figure 1. Hedonic level is a dimension independent of affect intensity and is formed from scales that Diener and his colleagues term *Positive Affect* and *Negative Affect.* Although these scales are termed *Positive Affect* and *Negative Affect,* they are not equivalent to the independent PA and NA dimensions proposed by Watson and Tellegen (1985). Rather, the scales of positive and negative affect used by Diener and his colleagues typically use terms such as *happy, joyful,* and *pleased* for positive affect, and *depressed, blue,* and *unhappy* for negative affect. Thus, these terms appear to define the single bipolar dimension of pleasantness–unpleasantness seen in Figure 1 (see Diener & Iran-Nejad, 1986; or Watson, 1988b).

The affect dimensions discussed in the preceding paragraph have been related to the four historical temperament types (Diener et al., 1985; Zevon & Tellegen, 1982). The choleric, characterized by a hot-headed, quickly excited, and quickly changed emotional reactivity, is seen by Diener et al. (1985) to represent the high end of emotional intensity, whereas the phlegmatic, characterized by a measured, principled, relatively emotionless approach to life, is seen to represent the low end of emotional intensity. In contrast, Diener et al. (1985) conceived of the sanguine temperament, characterized by a carefree, sociable, and good-natured approach to the world, as representing the positive end of the hedonic-level dimension, whereas the melancholic temperament, characterized by a serious, anxious, unhappy, and suspicious approach to the world, is representative of the negative end of the hedonic-level dimension. Thus, in Figure 1 the dimensions displayed on the diagonals appear to *define* these four temperament types, and the dimensions of PA and NA *delineate* the quadrants in which these four types of individuals are found. Consistent with our directional analogy, these are simply alternative ways of describing the same phenomena. That is, one could get to the northeast (the choleric quadrant) by following a unitary path along this dimension

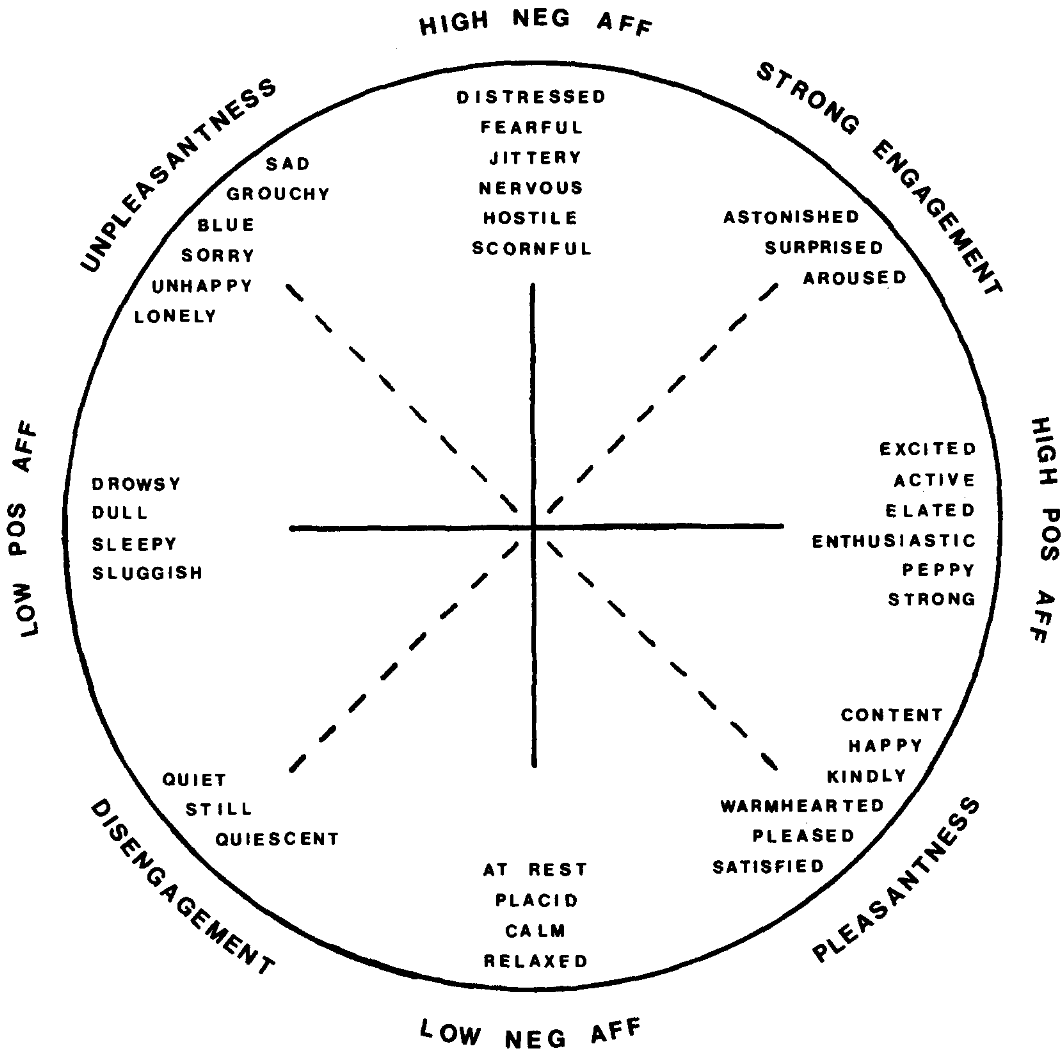

Figure 1. The structure of emotional experience proposed by Watson and Tellegen (1985), showing the major dimensions of positive affect (horizontal) and negative affect (vertical) and their relationship to Russell's (1979) alternative dimensions of pleasantness and arousal (engagement) and/or Larsen and Diener's (1985) alternative dimensions of hedonic level (pleasantness) and emotional intensity (engagement). (Neg Aff = negative affect, Pos Aff = positive affect. From "Toward a Consensual Structure of Mood" by D. Watson and A. Tellegen, 1985, *Psychological Bulletin, 98,* p. 220. Copyright 1985 by the American Psychological Association. Adapted by permission.)

(e.g., high affect intensity), or one could get to the same place by first going north (high NA) and then east (high PA).

Personality Models

This discussion of the four temperaments is significant because personality researchers have also drawn frequent parallels to this typology. In Figure 2, the relation of introversion–extraversion (E) and neuroticism–stability (N) to the four temperament types is explicated. It can be seen that these two dimensions, like PA and NA, delineate rather than define the choleric, melancholic, phlegmatic, and sanguine types.

The dimensions of E and N have been extensively analyzed over the past 30 years, making it unnecessary to discuss the evidence for their validity here. There is sufficient evidence to suggest that these dimensions are robust, well-researched variables that fit Buss's (1984) criteria for true within-species individual differences. Furthermore, we believe there is sufficient evidence to suggest that these dimensions form suitable "coordinates" for orienting researchers to the study of personality (*n*euroticism [*n*orth]–*s*tability [*s*outh], *e*xtraversion [*e*ast]–introversion [west]).

Despite the salience of these dimensions, the issue of proper rotation has also arisen within two-dimensional personality space. Gray (1972, 1981) has suggested that the two dominant dimensions of personality are found at a 45° rotation to the dimensions proposed by H. J. Eysenck (1981). Gray (1981) contended that the dominant dimensions are an anxiety dimension and, orthogonal to this, an impulsivity dimension. These dimensions are depicted on the diagonals in Figure 2. With the exception of physical fatigue terms proposed to define low positive affect in Figure 1, the similarities—including rotational disagreements—between models of affect and models of personality are apparent when Figure 2 is compared with Figure 1.

The Present Study

The present study has three broad agendas. First, the primary interest is in the structural convergence of mood and personality models. We are specifically hypothesizing a convergence across dimensional structures, so an orthogonally rotated factor analysis of combined mood and personality data is conducted.[2] We expect that a two-factor solution will be the most appropriate for this combined data, and that E and PA will converge to define a single broad dimension, and N and NA will converge to define a separate but unitary broad dimension within this two-dimensional space.

Our second agenda is to examine the model of mood presented in Figure 1 for its structural dimensions and for its circumplex nature. To accomplish this, four interrelated issues are addressed. We first determine if the dimensions that emerge from the terms in Figure 1 are the same PA and NA dimensions found by previous researchers. As these dimensions have been found and replicated repeatedly, we expect that they will again emerge in the present study. Second, we determine whether the dimensional structure of mood is consonant across state- and trait-rating formats. Watson (1988b) provided extensive data that the dimensional structure of PA and NA was virtually identical across six different rating time frames that ranged from "right now" to "generally or on average." Given this, we expect no dimensional differences to be present across state and trait solutions.

Third, we determine whether the placement of mood terms in specific octants is consonant across state- and trait-rating formats. It is possible that the precise placement of some mood terms may vary across ratings, even though the dimensions of PA and NA do not. For example, Watson (personal communication, June 12, 1987) has noted that the terms *sluggish* and *sleepy* fall in the low PA octant under a "right now" rating time frame, indicating a lack of zest or enthusiasm. The same terms rated under a "generally" time frame, however, tend to load more strongly on high NA, suggesting depressive symptoms. As the placement of terms in Figure 1 was made on the basis of "right now" or "today" rating formats, it will be informative to determine if and how the circumplex nature of the model shifts over the different rating formats.

Finally, we determine how closely the octal placement of mood terms corresponds to the circumplex expectations of Figure 1. Despite the replicability and stability of the PA and NA dimensions, the exact octal placement of mood terms has a less solid empirical base, particularly as the mood terms listed in Figure 1 have never been analyzed together in a single study. Thus, it will be informative to examine both state and trait mood solutions for their circumplex nature. Results from these analyses are presented before assessing the convergence of mood and personality.

The third broad agenda is to explore the manifest differences between state mood, trait mood, and personality. This is done by constructing scales of NA and PA and examining their relation to the personality measures of E and N over several occasions. Although we expect trait mood and state mood to display a structural convergence with extraversion and neuroticism, we also expect there to be measurable differences among these three realms.

First, as Fridhandler (1986) has pointed out, states are more short term, continuous, concrete, and situationally caused than traits. Second, it appears to us that questionnaires addressing themselves to state mood, trait mood, and personality are tapping into different types of subject response processes (see also Tellegen, 1985). When subjects are asked to respond to questionnaire items about their personality, they appear to refer to propositions regarding their selves, and therefore to respond from well-explicated self-schemas (e.g., Alba & Hasher, 1983). For personality, the process of self-report may be to start with general beliefs about the self ("I believe I'm a nice person") and deduce from these general beliefs how to respond to particular questions about behavior ("Therefore, it's 'true' that if I saw someone in distress I'd probably lend a hand if at all possible"). This process of self-report is potentially very different than the process individuals would go through to respond to a mood questionnaire. Particularly when individuals are asked to report on their state mood, the process would tend to be more inductive ("What are the feelings that I've been having in the past day? What am I feeling right now?") and tied to actual internal experiences. These responses are less subject to the influence of self-schema predications that the individuals may have about how they "should" or "would" be. Reporting trait mood would appear to be subjected to both the deductive and inductive processes we have discussed.

Given these differences and those noted by Fridhandler (1986), we predict that trait mood scales will show strong corre-

[2] For all of the factor analyses, an orthogonal rotation was used. This was done primarily to maintain continuity with previous research. It could be argued that an orthogonal rotation forces independence between the dimensions, when in fact this may not exist, and therefore an oblique solution would be most appropriate. Although there is validity to this argument, there would also be conceptual problems with an oblique rotation in the present measures. Given the mood model in Figure 1, which displays clusters of terms with differing densities in the two-dimensional space, and given that a two-dimensional oblique solution will seek out the two clusters of highest density, we would have to predict in an oblique analysis that one axis would fall between terms of pleasantness and high positive affect, and the other axis would fall between terms of unpleasantness and high negative affect. Therefore, the use of an oblique solution would be untenable because it would force us to predict a different set of hypotheses *if the model in Figure 1 is in fact correct.* By the same token, however, the clustering of terms within a two-dimensional space can force an orthogonal solution to place dimensions at a particular location. A "true" circumplex would need to have the same density of terms in all octants of the space and, if this was an accurate map of the emotional space, the location of dimensions within this space would be entirely arbitrary.

lations to their corresponding state mood scales and personality scales. We predict, however, that personality scales will only display mild to moderate correlations with their corresponding state mood scales.

Method

Subjects and Procedures

Subjects were 231 undergraduate students (99 men, 121 women, and 11 who did not indicate their gender) who participated in this study for course credit. All subjects completed a measure of state mood, trait mood, and personality. Over a 5-week period, 69 subjects were also retested on two occasions. Three weeks after the first testing, these subjects rated themselves on state mood. Two weeks after this, they completed personality, trait mood, and state mood ratings.

Measures

Affect. Two single-page emotion questionnaires were used. Each consisted of a random presentation of the terms listed in Figure 1. A Likert-type response format was placed below each of the emotion terms. The response options (very unlike me, unlike me, like me, and very like me) were symmetrical, did not leave open the possibility of subjects replying that they could not decide, and have demonstrated less bias than other response formats (see Meddis, 1972; Russell, 1979). One questionnaire asked subjects to indicate how they "generally feel" with regard to the emotion terms presented (trait-rating format), whereas the other ques-

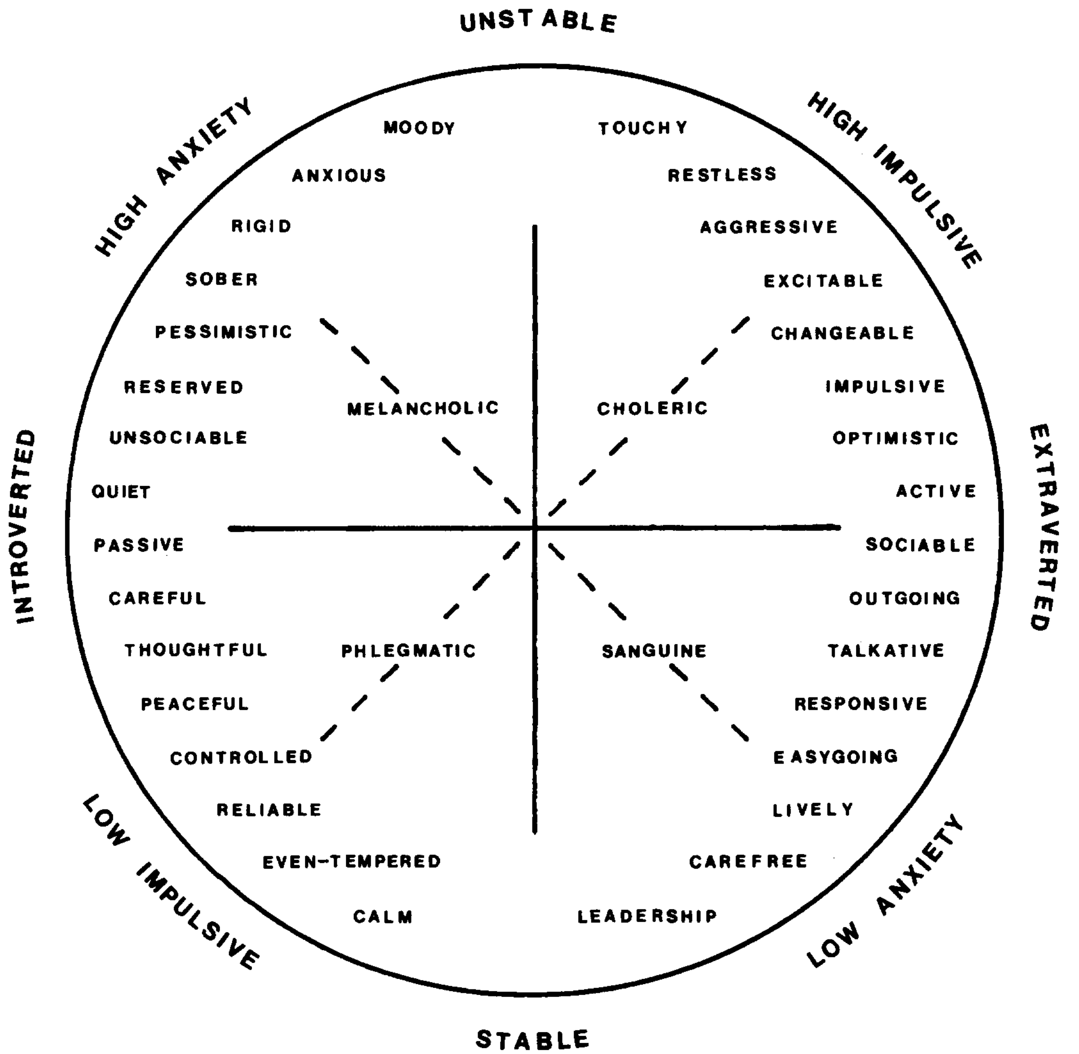

Figure 2. The structure of personality traits showing the dimensions of introversion–extraversion (horizontal) and neuroticism–stability (vertical) and their relation to the four personality types described by Hippocrates, Galen, and Wundt; the alternative personality dimensions proposed by Gray (1981) are on the diagonals. (From *Personality and Individual Differences: A Natural Science Approach* (p. 50) by H. J. Eysenck and Eysenck. New York: Plenum Press, 1985. Copyright 1985 by H. J. Eysenck and M. W. Eysenck. Adapted by permission.)

tionnaire asked subjects to indicate how they had felt "in the past day" (state-rating format).

Personality. For assessing the personality traits of E and N, the 100-item, forced-choice Eysenck Personality Questionnaire–Revised (EPQ–R; S. B. G. Eysenck, Eysenck, & Barrett, 1985) was used. This measure is the most recent revision by the Eysencks for assessing the personality dimensions of E, N, and P (psychoticism). Several changes had been made in this most recent version of the test (mostly to the P scale). Because there was some uncertainty regarding the changes in the EPQ–R, all results from this study were conducted with the N and E scales from this questionnaire's predecessor, the Eysenck Personality Questionnaire (EPQ; H. J. Eysenck & Eysenck, 1975). The EPQ E and N scales were formed by simply dropping the items that were added to these scales in the EPQ–R (two items for E, one item for N).

Data Analysis

Following the methodology proposed by Watson and Tellegen (1985), all factor analyses used principal-factor analysis with *R*-squares on the diagonal. Using their procedure (see p. 220), the number of factors to be retained for examination and rotation were found above the point at which there was a marked "elbow" in the plot of the eigenvalues. This procedure retains the broadest dimensions that define the data[3] and is essentially equivalent to selecting a larger number of factors (e.g., by Kaiser's criteria) and subjecting the resultant factors to a second-order factor analysis (see Watson & Tellegen, 1985).

Results and Discussion

Mood

Preliminary analysis. Before factoring, the *general* and *current* ratings of the 38 terms in Figure 1 were intercorrelated and examined for their factoring suitability. The Bartlett test of sphericity ($p < .000001$ for both data sets) and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (.85 and .88, respectively) indicated that the data sets were very suitable for factoring. However, SPSSX produced a warning in both data sets that the correlation matrix was ill conditioned. This warning suggested that there was a degree of singularity or colinearity within the mood terms. Rough assessment of colinearity (initial communalities that approached 1.0) did not indicate that this was a problem. However, rough measures of singularity (individual KMO indexes and low initial and final communalities) suggested 3 potentially problematic terms—*quiescent, placid,* and *at rest.* These 3 terms had the lowest average initial (below .45) and final (below .15) communalities across the trait and state data sets. Additionally, these 3 terms displayed unusual placements when the state and trait data were factored. For example, *quiescent* and *placid* tended to cluster with terms of arousal and engagement in both data sets. Finally, when these 3 terms were excluded from the factor analysis, the SPSSX warning message was no longer present in either data set. It was decided to drop these terms from further analyses.[4]

Underlying dimensional structure. Using the 35 remaining mood terms, the eigenvalues for each of the unrotated solutions were examined (see Table 1). There was a high degree of structural similarity across both data sets. When the eigenvalues were plotted, a marked elbow was observed at the third factor in each solution, indicating that the first 2 dimensions were the most dominant. For the trait solution, the first factor accounted for 48.29% of the common variance, and the second factor accounted for an additional 22.86% of the common variance. Similarly, the first factor in the state solution accounted for 49.94% of the common variance, and the second factor accounted for 21.32% of the common variance. Thus, in both data sets, a two-factor solution accounted for the vast majority of common variance (approximately 70%), although it did not exhaust the replicable variation among terms.

Table 1
Factors and Their Corresponding Eigenvalues From the Unrotated Principle Factor Analysis of the Trait and State Mood Solutions

	Solution	
Factor	Trait	State
1	9.211	10.152
2	4.360	4.334
3	2.073	2.461
4	1.762	1.953
5	1.651	1.444
6	1.291	1.241
7	1.140	1.069
8	1.005	0.932
9	0.944	0.870
Overall common variance	19.072	20.327

A varimax rotation was performed on the mood items from each data set. The loadings for each term on the first and second factor in the orthogonal trait and state solutions are presented in Table 2. The terms that loaded most strongly on Factor 1 in both the state and trait data sets suggested that this was an NA dimension. Factor 2, on the other hand, was strongly defined by positive affect terms in both data sets. It was desirable, however, to have a more psychometrically rigorous means of assessing whether the same PA and NA dimensions that had been found previously emerged in the present data sets.

To assess this concordance, the factor loadings from the state and trait data were intercorrelated with the loadings from corresponding terms published by Zevon and Tellegen (1982; 18 identical terms) and the unpublished loadings from Watson (1988b, Study 2; 17 identical terms). Both of the latter data sets used a "right now" response set for the mood ratings, and the Zevon and Tellegen study was designed to include a comprehensive sampling of mood terms. The data revealed the expected convergence of dimensional structure (see Table 3). Convergent correlations for the various dimensions of PA ranged from .95 to .99, as did the convergent correlations among the various

[3] Note that this procedure is not necessarily equivalent to Cattell's scree test, which may extract additional smaller factors.

[4] When the data were being collected, many subjects asked for the definition of *placid* and *quiescent* or left these terms blank on the questionnaires. The arcane nature of these terms may have generated misunderstanding and led to inconsistent responding across subjects—increasing their degree of singularity when compared with other mood terms.

Table 2
Term Loadings for the Two-Factor Varimax Rotated Trait and State Solutions

Item	NA factor T	NA factor S	PA factor T	PA factor S	Item	NA factor T	NA factor S	PA factor T	PA factor S
Distressed	.76	.69	−.11	−.15	Excited	.08	.02	.70	.69
Sad	.75	.71	−.06	−.22	Elated	.02	.01	.65	.60
Blue	.70	.75	−.16	−.26	Enthusiastic	−.08	−.14	.64	.74
Unhappy	.69	.71	−.26	−.37	Happy	−.34	−.39	.62	.71
Lonely	.69	.65	−.22	−.20	Active	−.28	−.19	.61	.61
Sluggish	.64	.66	−.20	−.28	Peppy	.06	.02	.58	.63
Drowsy	.62	.51	−.08	−.28	Pleased	−.33	−.29	.56	.75
Grouchy	.61	.57	−.22	−.25	Content	−.42	−.29	.52	.64
Jittery	.60	.56	.02	−.02	Satisfied	−.40	−.36	.51	.54
Sorry	.58	.64	.15	.17	Aroused	.16	.17	.51	.50
Sleepy	.57	.45	−.07	−.19	Surprised	.30	.40	.46	.32
Fearful	.57	.71	.01	−.03	Astonished	.31	.42	.25	.21
Nervous	.55	.60	.10	−.05	Warmhearted	−.12	−.09	.43	.44
Hostile	.54	.58	−.09	−.13	Strong	−.11	−.16	.39	.51
Dull	.48	.53	−.42	−.36	Kindly	−.09	−.11	.33	.47
Scornful	.46	.49	−.05	−.06	Quiet	.25	.26	−.27	−.31
Relaxed	−.39	−.25	.31	.29	Still	.22	.28	−.15	−.16
Calm	−.34	−.27	.22	.19					

Note. $N = 231$. NA = negative affect; PA = positive affect; T = trait solution; S = state solution.

dimensions of NA. The discriminant correlations were uniformly negative and high. This is a deceptive phenomenon that is unique to a two-factor solution where factor loadings are correlated. High negative correlations occur even when the dimensions are in fact independent of each other (see Zevon & Tellegen for a more complete discussion). If factor scores are correlated, they are not subject to the same constraints as factor loadings, and therefore yield a more precise index of discriminant relations within a two-factor solution. To exemplify this, scales of the state factor scores were correlated with the trait factor scores within the trait data set. This revealed the same high convergent correlations observed in Table 3. (.98 for PA and .97 for NA); however, as expected, the discriminant correlations were now found to be near zero (−.02 for trait NA with state PA, and .03 for trait PA with state NA).

These analyses indicated that Factor 1 in the state and trait data was essentially identical to the NA dimension reported by Zevon and Tellegen (1982) and Watson (1988b). Likewise, the second factor extracted from both data sets was essentially the same as the PA dimension found in previous research. Importantly, the *dimensional* structure of PA and NA did not appear to be affected by the different rating formats.

Octal placement of state and trait terms. To examine whether the octal placement of mood was differentially affected by trait and state ratings, and to assess the data's observed correspondence to the circumplex of Figure 1, graphs of each of the data sets were constructed. The placement of terms within a particular octant of the two-dimensional space was determined by creating eight 45° arcs on each of these graphs. Each arc was centered at the origins of the two factors and drawn to include 22.5° on either side of the NA, PA, engagement–disengagement, and pleasantness–unpleasantness dimensions. This is in accordance with the theoretical dictates of Figure 1 (see Table 4).

A fairly high degree of octal correspondence was observed across state and trait time frames. From the current study, 28 of the 35 terms (80%) were located in the same octant for both ratings. The 7 terms that fell in discrepant octants were terms that shifted across the unpleasantness–high NA border (*unhappy, grouchy, sluggish, drowsy,* and *sleepy*) and the high PA–pleasantness border (*active* and *pleased*). Only 2 of these 7 terms—both terms of physical fatigue—were discrepant by more than 10° across time frames: *sleepy* by 13° and *drowsy* by 20°. In the trait mood ratings, terms of physical fatigue were more clearly indicative of high NA, but in the state mood ratings the same terms were more clearly indicative of unpleasantness. With the exception of *pleased,* the mood terms that displayed discrepant octal placements had state solution loadings that were slightly more consistent with the structure presented in Figure 1.

In terms of the expected circumplex, both strong consistencies and major inconsistencies were found. Only about half (54% for state, 49% for trait) of the mood terms fell exactly where they were expected; however, about 75% fell within 7° of their expected octant (77% for state, 74% for trait). There was strong support for the terms expected to define high NA (*fearful, scornful, hostile, nervous, jittery,* and *distressed*) and high PA (*excited, enthusiastic, strong, active, elated,* and *peppy*). There was also good support for the terms expected to define engagement (*astonished, surprised,* and to a lesser degree, *aroused*) and four of the terms expected to define pleasantness (*content, happy, satisfied,* and *pleased*). Moderate support was found for some terms of unpleasantness (*unhappy, grouchy,* and *lonely*) and for terms expected to define low NA (*calm* and *relaxed;* although these fell into the pleasantness octant, they were clearly the best markers of low NA in the data sets). In general, terms expected to define unpleasantness tended to load signifi-

Table 3
Correlations Between the Factor Loadings of Positive Affect (PA) and Negative Affect (NA) Factors Across Time Frames and Studies

Factor	1	2	3	4	5	6	7	8
1. Present data, trait PA	—							
2. Present data, state PA	.98	—						
3. Zevon & Tellegen (1982) state PA	.95	.97	—					
4. Watson (1988c) state PA	.97	.99	.98	—				
5. Present data, trait NA	−.78	−.83	−.93	−.94	—			
6. Present data, state NA	−.79	−.84	−.95	−.96	.99	—		
7. Zevon & Tellegen (1982) state NA	−.78	−.81	−.83	−.92	.95	.95	—	
8. Watson (1988c) state NA	−.93	−.97	−.98	−.98	.98	.99	.98	—

cantly higher on high NA than on low PA, which placed them in or near the high NA octant.

The greatest inconsistencies from the expected circumplex of Figure 1 occurred for terms of disengagement and low PA. All of the terms expected to define these octants appeared to "migrate" slightly more than 45° in the direction of high NA. That is, terms that were expected to define low PA (*dull, drowsy, sleepy,* and *sluggish*) had observed loadings in the unpleasantness octant (state data) or high NA octant (trait data), whereas the two terms expected to define disengagement (*quiet* and *still*) were observed to load in the unpleasantness octant. Even though *quiet* and *still* fell within the unpleasantness octant, they were clearly the best markers of low PA in both data sets.

Discussion of mood results. From the preceding analyses, it was found that Figure 1 had a clear two-dimensional structure, which was shown to be essentially the same as the PA and NA structure found in previous research. Like previous research, the dimensional structure of mood was shown to be stable across state and trait ratings. Given this finding, it was appropriate to analyze the dimensional convergence of mood and personality models.

State and trait ratings did, however, have a localized effect on the octal placement of some mood terms. In particular, terms of physical fatigue were strong markers of high NA under a trait-rating format and markers of unpleasantness under a state rating format. Neither rating format showed these terms as markers of low PA.

In general, the terms of physical fatigue showed loadings similar to the mood structure that has been found in Japan (Watson et al., 1984). The only difference found between U.S. mood structure and Japanese mood structure was terms of sleepiness, which showed significant loadings on high NA but negligible loadings on the PA dimension. This difference was interpreted as being a culturally determined difference in the affective experience of fatigue. If this is true, it offers little explanation for the current findings.

As noted previously, Watson (personal communication, June 12, 1987) found that terms of physical fatigue showed a placement like that observed in the present data only when ratings were made over long time periods. Over short time periods (particularly with "moment" ratings), these terms loaded in the fashion outlined in Figure 1. One potentially important difference between the results reported by Watson and the current data resides in the fact that Watson's subjects rated different time frames on different days. In the present study, subjects completed both questionnaires at the same time, and the trait mood questionnaire was completed first. Thus, there might have been conceptual carryover effects from this procedure that made the loadings of state mood ratings more similar to the trait mood ratings and less complementary to the exact structure outlined in Figure 1. Given that the state mood data might have been influenced by the administration of the trait mood questionnaire that preceded it, at this point it seems reasonable to conclude that only the octal placement of trait mood is different than that presented in Figure 1. Further research using a "right now" or "at this moment" rating scale and an independently rated "general" mood questionnaire is needed to more adequately assess the stability or shifts of Figure 1 over time.

Finally, it is valuable to note that there was still a quasi-circumplex structure to the present data. Six, rather than eight, distinct clusters of terms could be seen across plots of the state and trait data. There were clusters of engagement, high PA, pleasantness, low NA, low PA, and unpleasantness–high NA, although the terms were not all exactly as anticipated. This finding may serve to guide future research in the development of a more complete circumplex of affect.

Personality and Mood Convergence

Before assessing the convergence of mood and personality, an analysis of the EPQ was conducted. The factor structure of the EPQ was examined through a principal-factor analysis of the 21 E and 23 N items. The first step in this analysis was an assess-

(text continues on page 700)

Table 4
The Expected Placement of Mood Terms From Figure 1 and Their Observed Octal Placement in State and Trait Solutions

	Observed condition			
	State solution		Trait solution	
Term	Octant	Degree	Octant	Degree
	HIGH NA (0° to 45°)			
Hostile	**HIGH NA**	**11**	**HIGH NA**	**12**
Nervous	**HIGH NA**	**18**	**HIGH NA**	**32**
Jittery	**HIGH NA**	**11**	**HIGH NA**	**13**
Distressed	**HIGH NA**	**10**	**HIGH NA**	**12**
Scornful	**HIGH NA**	**15**	**HIGH NA**	**17**
Fearful	**HIGH NA**	**21**	**HIGH NA**	**22**
	ENGAGEMENT (45° to 90°)			
Astonished	**ENGAGEMENT**	**51**	**ENGAGEMENT**	**107**
Surprised	**ENGAGEMENT**	**63**	**ENGAGEMENT**	**80**
Aroused	HIGH PA	92	HIGH PA	95
	HIGH PA (90° to 135°)			
Excited	**HIGH PA**	**111**	**HIGH PA**	**107**
Enthusiastic	**HIGH PA**	**122**	**HIGH PA**	**119**
Strong	**HIGH PA**	**130**	**HIGH PA**	**128**
Active	**HIGH PA**	**128**	PLEASANTNESS	136
Elated	**HIGH PA**	**112**	**HIGH PA**	**110**
Peppy	**HIGH PA**	**110**	**HIGH PA**	**106**
	PLEASANTNESS (135° to 180°)			
Content	**PLEASANTNESS**	**137**	**PLEASANTNESS**	**149**
Happy	**PLEASANTNESS**	**142**	**PLEASANTNESS**	**140**
Satisfied	**PLEASANTNESS**	**147**	**PLEASANTNESS**	**150**
Pleased	HIGH PA	133	**PLEASANTNESS**	**144**
Warmhearted	High PA	122	HIGH PA	128
Kindly	HIGH PA	128	HIGH PA	128
	LOW NA (180° to 225°)			
Calm	PLEASANTNESS	169	PLEASANTNESS	170
Relaxed	PLEASANTNESS	155	PLEASANTNESS	165
	DISENGAGEMENT (225° to 270°)			
Quiet	Unpleasantness	329	Unpleasantness	333
Still	Unpleasantness	353	Unpleasantness	348
	LOW PA (270° to 315°)			
Sleepy	Unpleasantness	360	High NA	13
Sluggish	Unpleasantness	358	High NA	05
Drowsy	Unpleasantness	353	High NA	13
Dull	Unpleasantness	347	Unpleasantness	341
	UNPLEASANTNESS (315° to 360°)			
Unhappy	**UNPLEASANTNESS**	**353**	HIGH NA	02
Grouchy	**UNPLEASANTNESS**	**358**	HIGH NA	03
Lonely	HIGH NA	04	HIGH NA	05
Blue	HIGH NA	02	High NA	08
Sad	HIGH NA	05	High NA	16
Sorry	High NA	36	High NA	40

Note. Boldface indicates a term observed in its expected octant, and capitalized terms are in or near their expected octant. The number following a term indicates its circular degrees from the octant beginning at the border between unpleasantness and high negative affect. NA = negative affect; PA = positive affect.

Table 5
Factors and Their Corresponding Eigenvalues From the Unrotated Principle Factor Analysis of the Trait Mood and Personality and the State Mood and Personality Solutions

	Solution	
Factor	Personality and trait mood	Personality and state mood
1	14.101	13.948
2	6.915	6.633
3	3.808	4.175
4	2.808	3.186
5	2.199	2.556
6	2.015	2.255
7	1.907	2.014
8	1.825	1.917
9	1.657	1.714
10	1.596	1.608
Overall common variance	19.072	20.327

ment of the plotted eigenvalues (listed in decreasing magnitude, they were as follows: 7.16, 5.06, 2.13, 1.65, 1.59, 1.50, 1.40, 1.34, 1.28, 1.23, etc.; overall common variance: 19.32). When plotted, a clear elbow formed at the third factor indicating that a two-factor solution was most appropriate. A two-factor solution accounted for 63% of the common variance. Separated, the first factor accounted for 37.08% of the common variance and the second factor accounted for 26.19% of the common variance. A varimax rotation was then found for the two-factor solution. As expected, this process resulted in a clear discrimination of the E and N items.

Convergence findings. To assess the structural convergence of mood and personality models, two additional principal-factor analyses were conducted. The first consisted of the EPQ extraversion and EPQ neuroticism items together with all of the trait mood ratings, and the second consisted of the personality items and the state mood ratings. As anticipated, a plot of the eigenvalues again showed that there was a clear elbow after the second factor in each data set (see Table 5). In both data sets, the first factor accounted for approximately 29% of the common variance (personality with trait mood, 29.93%; with state mood, 29.11%) and the second factor accounted for approximately 14% of the common variance (with trait mood, 14.68%; with state mood, 13.89%). Together, therefore, the first 2 factors in each data set accounted for approximately 44% of the common variance. This is roughly equivalent to the percentage of common variance that would have been accounted for by the next 9 factors in each solution combined. Thus, it appeared that the first 2 factors were again the dominant dimensions in the data sets.

As a check on this finding, four-factor solutions were found for each of the data sets. All four factors were defined by both mood terms and personality items. The fact that none of the factors were pure mood or pure personality dimensions was significant and, further, indicated that these models share a common structural base.

To demonstrate the convergence of mood and personality structure more clearly, the factor scores generated within our various solutions were correlated. In each of the two combined mood and personality solutions, the mood terms or the personality items were considered marker variables. The factor scores for these marker variables from within this combined mood and personality space were then correlated with the factor scores obtained from the individual mood or personality factor analyses (Rummel, 1970). The correlations that resulted from this procedure lent themselves to readily interpretable convergent and discriminant values because they were based on factor scores, not factor loadings. Table 6 displays the convergent and discriminant correlations from these analyses.

All of the convergent correlations were exceedingly high, never dropping below .95. Additionally, the discriminant correlations were uniformly low, never exceeding +/−.18. This pattern of results indicated that the two dimensions that emerged in the combined mood and personality data sets were virtually identical to the dimensions of PA and NA found to underlay the separate state mood ratings and the separate trait mood ratings. At the same time, the two dimensions that emerged in the combined mood and personality data sets were also virtually identical to the dimensions of extraversion and neuroticism found to underlay the separately analyzed personality data. This was strong support for the hypothesis that the dominant two-dimensional model of mood (PA and NA) and the dominant two-dimensional model of personality (E and N) share the same structural basis.

Figure 3 visually displays the convergence of personality and trait mood structure in two-dimensional space. Examination of Figure 3 reveals that the neuroticism items clustered most densely with terms denoting high NA, unpleasantness, and physical fatigue. As expected, terms of unpleasantness (with the

Table 6
Correlations Between the Factor Scores of Mood Terms or Personality Items Generated From Combined and Separate Solutions

Separate solution factor score	Combined solution factor score: Factor 1 (N–NA)	Factor 2 (E–PA)
	Personality with trait mood	
Trait mood data		
Factor 1 (NA)	.99	−.15
Factor 2 (PA)	−.05	.95
Personality data		
Factor 1 (N)	.99	.17
Factor 2 (E)	.06	.98
	Personality with state mood	
State mood data		
Factor 1 (NA)	.98	−.18
Factor 2 (PA)	−.17	.96
Personality data		
Factor 1 (N)	.98	.18
Factor 2 (E)	.14	.97

Note. $N = 231$. N = neuroticism; NA = negative affect; E = extraversion; PA = positive affect.

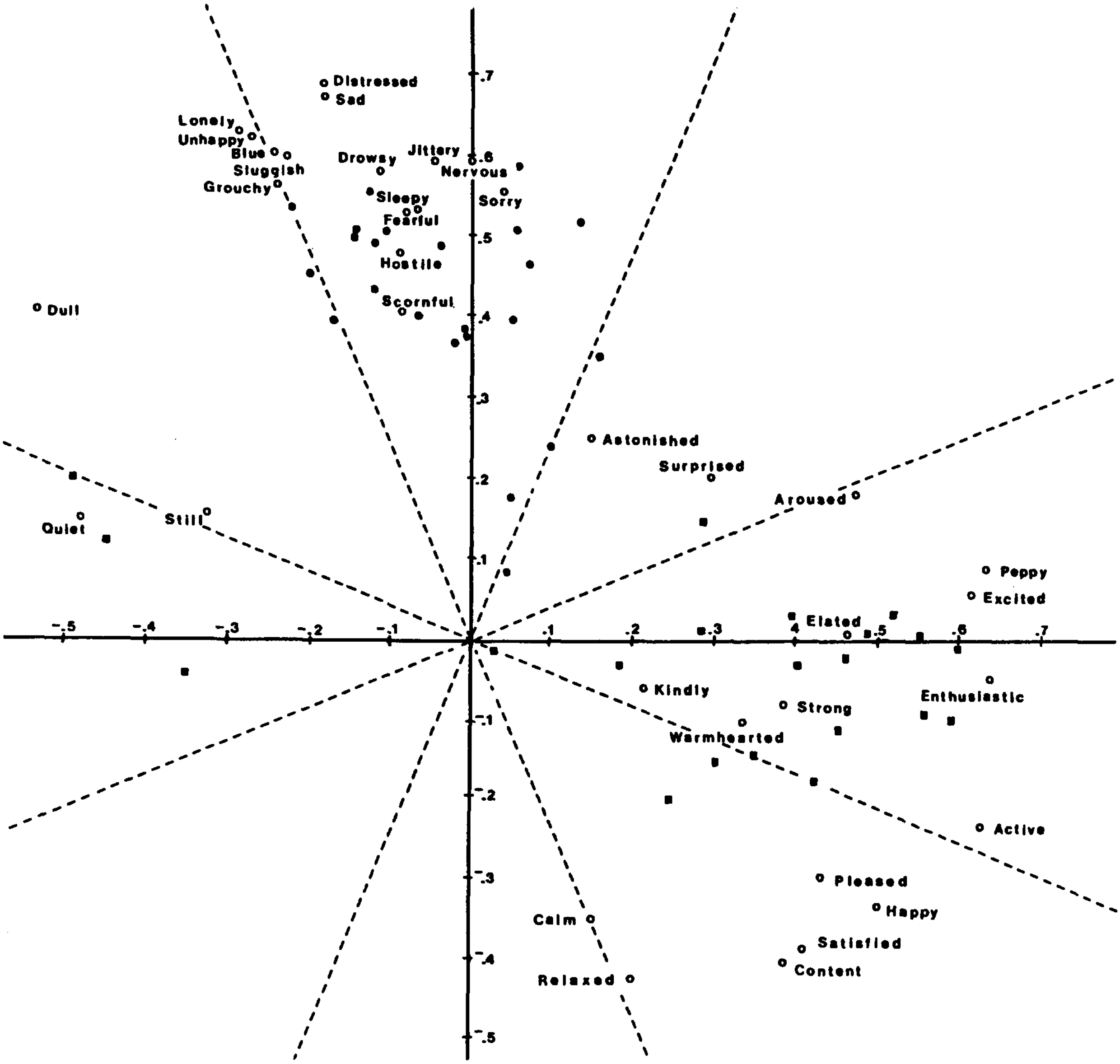

Figure 3. The two-dimensional factor structure of combined trait mood and personality. (Open circles represent the placement of mood terms; closed circles represent neuroticism items; closed squares represent extraversion items. The dashed lines indicate octant boundaries.)

exception of *sorry* and *sad*) were differentiated from terms of high NA by their moderate negative loadings on the second dimension. The low end of the first dimension was defined most clearly by the terms *relaxed* and *calm*, which was also consistent with hypotheses. Thus, it could be seen that neuroticism items and NA terms defined a common dimension in a shared mood–personality space. Furthermore, when this shared mood–personality space was based on trait ratings of affect, terms of physical fatigue were generally good markers of high NA–neuroticism.

It was also apparent that E and PA shared a common source of variation, as terms of E and high PA most clearly defined the high end of the second factor. In contrast to Figure 1, but consistent with the prior factor analyses of these mood terms, *quiet* and *still* were seen to be mood terms that most clearly defined the low end of the trait E–PA dimension.

With regards to the octal structure of mood addressed earlier, the data plotted in Figure 3 displayed essentially the same octal placement of trait mood terms as in Table 4. This indicated that there was a remarkable stability of basic mood structure despite the addition of nearly 45 personality items. In terms of precise octal location, six of the mood terms shifted their placement slightly in the combined mood–personality analysis (*unhappy, grouchy, lonely, active, calm,* and *quiet*). Only one of these terms, *quiet,* involved a shift of more than 9°. Interestingly, the slight shifts observed in the placement of these terms when they were factored with the personality data made them more consistent with the expectations of Figure 1.

Discussion of convergence results. The present set of analyses have demonstrated that the two-dimensional structure of mood—whether it is assessed as a state or a trait—and the two-dimensional structure of personality share a common core source of variation. This finding brings a cohesive, unifying framework to the study of affect and personality and offers further validity for the PA and NA model of mood and the E and N model of personality to be the "basic coordinates" that can orient researchers in each domain.

The fact that the octal placement of trait mood was found to be more consistent with Figure 1 when analyzed in conjunction with personality data suggests two things. First, it argues against the notion that trait ratings damage the general structure of Figure 1, even though trait ratings appear to have a localized and specific effect on the terms of physical fatigue. Second, it suggests that the inclusion of introversion items (additional low E–PA items) may have helped stabilize this quadrant of the two-dimensional space.

The more extensively analyzed personality dimensions of E and N also provide some insight into why the octal structure of trait mood was different than that displayed in Figure 1. A look at Figure 2 reveals that H. J. Eysenck and Eysenck (1975) had placed the term *quiet* at precisely the place where it was found in the current analysis on the dimensions that are now seen to be E–PA and N–NA. In describing the dimension of extraversion, H. J. Eysenck and Eysenck stated that the "typical introvert is a *quiet,* retiring sort of person, introspective, . . . reserved . . . does not like excitement . . . keeps his feelings under close control. . . ." (p. 5, italics added). The mood terms *quiet* and *still* fit with this description more than the terms *dull, drowsy, sleepy,* or *sluggish.* Given this, it is not surprising to find that the terms *quiet* and *still* defined low PA when it was assessed as a mood trait.

In the trait mood ratings, it was also seen that feelings of physical fatigue fell in the high NA octant. This was in contrast to Figure 1. However, in terms of personality, H. J. Eysenck and Eysenck (1975) characterized the high N individual as one who "is likely to sleep badly" (p. 5), presumably as he or she anxiously worries about things done or things that may go wrong. When an examination of the EPQ N items was conducted, it was found that several of the N items tap directly into emotions of physical fatigue (e.g., "Do you suffer from *sleeplessness?*"; "Have you often felt listless and *tired* for no reason?"; "Are you sometimes bubbling over with energy and sometimes very *sluggish?*"; and "Do you often feel life is very *dull?*"; S. B. G. Eysenck et al., 1985; italics added). Thus, the observed circumplex of trait mood was found to contradict Figure 1 but to be consistent with the E and N model of personality. This suggests the need to revise Figure 1 when modeling trait mood.

The proportion of common variance explained by the two dimensions in the combined mood and personality space was less than when either source of data was analyzed separately. This indicated that even though the underlying structure was the same, there were differences between the mood and personality domains. It is to the distinctions among the domains of state mood, trait mood, and personality that the final set of analyses were geared.

Manifest Differences Between State Mood, Trait Mood, and Personality

Scales of PA and NA were constructed on the basis of Figure 1 and the previous mood analyses. We decided to use the terms from Figure 1 that were expected to define high PA and high NA, as well as the terms that were observed to be the best markers of the low end of these dimensions. Consequently, the PA scale included *excited, elated, enthusiastic, peppy, strong, active, quiet* (reversed), and *still* (reversed), whereas the NA scale included *distressed, fearful, nervous, jittery, hostile, scornful, calm,* (reversed), and *relaxed* (reversed).

The reliabilities (coefficient α) for these scales were determined with the state and trait data and are presented in Table 7 along with the extraversion and neuroticism reliabilities. All scales displayed a satisfactory level of content homogeneity, although the mood scales tended to have reliabilities slightly lower than the personality scales. This was not surprising, given that the mood scales were based on 8 items and the personality scales were based on more than 20 items.

The scales in Table 7 were then intercorrelated over the three testing occasions (see Table 8). As would be expected, the 5-week test–retest reliabilities for the personality scales were quite high (E = .86, N = .86), as were the test–retest reliabilities for trait mood—although trait PA (.86) was more resistant to temporal influences than trait NA (.71). As expected, the test–retest reliabilities for the state mood scales were significantly lower over this 5-week period (PA = .52; NA = .55), and they even displayed much more moderate temporal consistency over 2- and 3-week time frames (PA = .52 and .59, respectively; NA = .43 and .56, respectively). These results were in accord with theoretical predictions of trait longevity and state variability. Comparing the general magnitude of convergent correlations across these two types of affect, it was interesting to note that NA appeared slightly more vulnerable to changes over time than PA. Given that the data were collected from students over the middle portion of the semester, one hypothesis for this finding is that the NA variability might have reflected fluctuations in academic pressures.

The personality scales displayed a strong convergent relation to the trait mood scales (the average correlation of E with trait PA was .69, and the average correlation of N with trait NA was .55). This was in contrast to the mild to moderate magnitude of convergent correlations observed between personality and state mood variables (the average correlation between E and state PA was .51, and the average correlation between N and state NA was .38). As expected, however, there was a moderately strong convergent correlation between state mood and trait mood (the average correlation of trait PA with state PA was .61, and the average correlation of trait NA with state NA was .48). Therefore, trait mood, in accordance with theoretical expectations, displayed a similar degree of relatedness to both measures of personality and measures of state affect.

The discriminant correlations were generally mild and

Table 7
The Internal Consistency Reliability of the Positive Affect, Negative Affect, Extraversion, and Neuroticism Scales

Scale	Internal consistency reliability
Extraversion	.83
Neuroticism	.87
Trait PA	.77
State PA	.80
Trait NA	.80
State NA	.81

Note. All reliabilities are based on the full sample of 231 subjects. NA = negative affect; PA = positive affect.

ranged in magnitude from −.01 to −.38, with an average correlation of −.18. The average discriminant correlation between personality scales was observed to be −.24; between personality and trait mood scales, it was −.21, and between personality and state mood scales, it was −.17. The average discriminant correlation between trait mood scales was −.15; between state mood scales, it was −.21, and between state and trait mood scales, it was −.15. These mild negative correlations run counter to the theoretical expectation that E and N, and PA and NA are independent dimensions. It has been reported, however, (S. B. G. Eysenck, Barrett, Spielberger, Evans, & Eysenck, 1986) that the personality dimensions of E and N display a mild negative correlation within a young adult population. As the normative population ages, the dimensions become statistically independent. It is unknown whether the same aging phenomenon is also true for mood dimensions. With a college-age sample, however, scales of PA and NA have been shown to correlate to a similar mild degree ("today" format = −.12, "past few days" format = −.21, and "general" format = −.26; see Watson, 1988b, Table 2). Thus, although the scales of personality, mood, and their combinations did not display complete independence, they did display the same pattern of discriminant relations, particularly when the full sample data was consulted. This pattern again supports a common structural core for these two domains.

General Discussion

Except for the lower left quadrant of the expected mood circumplex, the results of this study supported our major hypotheses. It was shown over a wide range of emotional terms that the structure of state and trait mood, at the broadest level, was best represented by two dimensions. These two dimensions accounted for the majority of the replicable variance, were invariant over state and trait ratings, and were clearly seen as dimensions of PA and NA. Additionally, it was shown that the PA and NA model of mood shared a structural identity with the extraversion and neuroticism model of personality. Regardless of whether mood was assessed as a state or a trait, PA and E defined a common dimension of individual variation, and NA and N defined a second dimension of individual variation. Finally, even though the core structure of state mood, trait mood, and personality was equivalent, it was shown that there were important manifest differences among these three domains.

The fact that there is a broadly defined two-dimensional structure that is common to both the empirical study of mood and the empirical study of personality generates an important link between the substantial literatures associated with these two domains of investigation: a link that we believe can fruitfully stimulate the further evolution of both domains. Eysenck's (1981) E and N factors have a long and extensive history as broad, replicable, and meaningful individual difference dimensions. It is encouraging, however, to see that these same two dimensions, as PA and NA, began to emerge from a separate field

Table 8
The Correlations Observed Between Measures of Personality, Trait Mood, and State Mood Over a 3- and 5-Week Period

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13
1. E1	—												
2. E3	**86**	—											
3. PAT1	**66**[a]	**65**	—										
4. PAT3	**70**	**73**	**86**	—									
5. PAS1	**50**[a]	**62**	**60**[a]	**66**	—								
6. PAS2	**42**	**56**	**58**	**60**	**52**	—							
7. PAS3	**46**	**52**	**58**	**63**	**52**	**59**	—						
8. N1	**−20**[a]	**−27**	**−17**[a]	**−32**	**−19**[a]	−08	−23	—					
9. N3	**−24**	**−26**	**−38**	**−38**	**−26**	−19	**−25**	**86**	—				
10. NAT1	**−22**[a]	−13	**−18**[a]	−20	**−17**[a]	−21	−16	**63**[a]	**52**	—			
11. NAT3	−03	−03	−15	−08	−10	−19	−02	**49**	**56**	**71**	—		
12. NAS1	**−11**[a]	**−25**	**−15**[a]	−22	**−23**[a]	−23	−18	**54**[a]	**39**	**61**[a]	**59**	—	
13. NAS2	−11	−13	−20	−18	−01	**−33**	**−26**	**32**	**39**	**34**	**39**	**43**	—
14. NAS3	−08	−16	−16	−21	−16	**−35**	−19	**27**	**39**	**38**	**56**	**55**	**56**

Note. Correlations significant at $p = .05$, two-tailed, are in boldface. E = extraversion; N = neuroticism; PAT = positive affect, trait rating; PAS = positive affect, state rating; NAT = negative affect, trait rating; NAS = negative affect, state rating; 1 = first testing; 2 = second testing, 3 weeks after the first; 3 = final testing, 5 weeks after the first.
[a] Correlations are based on $N = 231$ (all others are based on $n = 69$).

of study. The present research provides further support for using these two personality-mood dimensions as paradigmic coordinates for the study of individual differences.

From the present study, as well as from previous research cited, the application of an orthogonal factor analytic rotation to a large data pool can be likened to the magnetization of steel for the purpose of forming a compass. This process reveals "basic coordinates" that allow a map or a frame of reference to be placed on research findings that may otherwise remain unintegrated.

For example, Diener et al. (1985) used the scales of affect intensity and hedonic level (frequency) to assess the structure of mood. In the view we are proposing, these scales measure the diagonal vectors that are at a 45° rotation to E–PA and N–NA (the dimensions from northeast to southwest and northwest to southeast, respectively). Diener et al. noted that an individual can be both "choleric" and "sanguine" at the same time (p. 1263). Without the model elucidated here, it may be difficult to understand how this is so, and indeed this result is reported as a somewhat surprising finding.

Within the E–PA and N–NA system, a choleric is one who is high on both dimensions because the choleric quadrant is delineated by these two dimensions. For the same reason, a sanguine type is one who scores high on E–PA but low on N–NA. Within the alternative rotation system, however, a choleric is one who scores highly only on a measure of affect intensity (arousal), because now the choleric quadrant is defined by this scale. For the same reason, a sanguine type scores highly only on a scale of positive hedonic level. Diener et al. (1985) reported the situation where a person scores highly on both affect intensity and positive hedonic level. An error of terminology, however, crept into their discussion because they failed to realize that when one scores significantly away from the mean on two independent dimensions, this person must lie in the quadrant delineated by those factors (which means that the person can no longer be considered the type defined by either one of these dimensions). In the Diener et al. data this was the high E–PA quadrant.

A person high on the E–PA dimension and in the midrange of the N–NA dimension would score moderately high on a scale of affect intensity, a choleric measure, and moderately high on a scale of positive hedonic level, a sanguine measure (just like Boston would be measured as northeast and southeast of Chicago if these were the only two vectors available for measurement). This does not mean that he or she is a choleric type and sanguine type at the same time—a conceptual conundrum—nor does it mean this person is high on N–NA at the same time that they are low on N–NA—an impossibility. It simply means that they are high on E–PA (just like Boston is not really both northeast and southeast of Chicago and definitely is not both north and south of Chicago; it is simply east of Chicago). If individuals within this quadrant of the "map" were of particular interest, it would be easiest to assess them with only the scales of E–PA and N–NA.[5]

Watson and Tellegen (1985) did much to systematize mood research at the broad factor level and forged the conceptual connection of these mood dimensions with the E and N dimensions of personality. In reciprocal fashion, the extensively researched and well-defined dimensions of E and N further clarified trait mood structure by showing that low PA–E is best characterized by long-standing moods of quiet stillness, and that terms of physical fatigue should have their strongest association with high NA–N. Future research that uses a greater number of "low affect" mood terms should be beneficial not only to clarify the low end of the E–PA and N–NA dimensions but also to clarify the lower left quadrant of the circumplex model.

Watson and Clark (1984) and others (Gotlib & Meyer, 1986; Meites et al., 1980; Tanaka-Matsumi & Kamoeka, 1986) began to systematically organize the psychological literature by identifying and demonstrating the convergence between variously named scales of N–NA. The psychological literature would benefit immensely through a similar systematic organization of the E–PA construct.

Another useful direction for future research would be the examination of convergence between the mood dimensions proposed by Russell (1978, 1979) and Larsen and Diener (1985) and the personality dimensions proposed by Gray (1981). It would be of particular significance to find out if these scales show the expected moderate correlations with both N–NA and E–PA, as well as the expected strong convergent correlations among themselves.

Recent evidence has indicated the presence of a third major dimension of personality (e.g., McKenzie, 1988; Zuckerman, Kuhlman, & Camac, 1988). Although the form of this bipolar dimension continues to be refined, it appears that it is anchored on one end by scales like H. J. Eysenck and Eysenck's (1985) Psychoticism (or toughmindedness), Jackson's (1967) Autonomy and Risk-taking, Zuckerman's (1979) Boredom Susceptibility, Wiggins's (1979) Arrogant–Calculating, and Kiesler's (1983) Mistrusting–Competitiveness. On the other end, this dimension is anchored by scales like the California Personality Inventory's Socialization (Gough, 1975), Costa and McCrae's (1985) Agreeableness, Jackson's Responsibility and Cognitive Structure, Wiggins's Unassuming–Ingenious, Kiesler's Trusting–Deferent, and Cattell, Eber, and Tatsuoka's 1970 second-order factor of Superego.

The mood structure literature also has reported a third salient dimension. However, it tends to be smaller and somewhat unreplicable. This dimension appears descriptively similar to the third dimension of personality discussed previously and has been termed *potency, dominance, aggression,* or *attention–rejection* (see Watson & Tellegen, 1985). It would be valuable for future research to clarify the bipolar nature of this dimension in the domain of personality and the domain of mood. Once this is done, further research assessing the convergence among these mood and personality factors may bring a third dimension of depth to the two-dimensional mood–personality model proposed here. The implications described earlier are obviously speculative and in need of further empirical investigation. However, the organization and conceptual clarity that could be brought to the study of mood and personality from their further

[5] Ease of measurement is obviously dictated by the question at hand. For this example, the E–PA and N–NA system is the easiest to use. If the choleric type was of greatest interest, however, the affect intensity and hedonic level rotational scheme would be the easiest to use.

integration and explication should certainly be worthy of additional effort.

Returning to our cartographic metaphor, we liken the manifest differences between state mood, trait mood, and personality to the fact that separate two-dimensional world maps can be developed to show rainfall, average temperature, and crop production. All three of these variables are interrelated and vary by their two-dimensional north–south and east–west position. Each of these three realms can be measured independently, however, and each provides a unique and important piece of information toward an overall picture. The research reported here has only scratched the surface of what promises to be a rich area of investigation among the dynamic interplay of these three realms. A number of questions in this regard appear salient: Are there genetic predispositions to mood states as there are to personality traits? As one's environment can be a powerful determinant of mood states, how do developmental experiences of an affective nature influence the generation of personality traits or self-schemas? How do mood states tend to fluctuate within the octants formed by the cross of the E and N personality traits? Further work that explores the hierarchical, nested, and causative relations among these areas would clearly be valuable.

Finally, in proposing the view that E–PA and N–NA represent the basic coordinates of personality and mood variation, we do not mean to imply that the other dimensions that can be placed in the same space are less meaningful. Obviously, it could be argued that the *unrotated* dimensions should be considered the most basic. Along these lines, it has been shown that there are a variety of effects that are predictable from the dimension of impulsivity (northeast, southwest vector) that are not as readily apparent from the dimensions of E or N alone (see Gray, 1981). Additionally, there is a growing literature that documents important effects found with the emotional intensity dimension of mood (e.g., Diener, 1987; Larsen, Diener, & Cropanzano, 1987) and the hedonic level, or pleasantness–unpleasantness dimension, of mood (Diener, Sandvik, & Pavot, 1989). Because of the results reported here and the literature discussed earlier, we have suggested that E–PA and N–NA be considered the "basic" coordinates of personality and mood. However, it is also true that the experimental question at hand will determine which dimensions are considered to be the most basic in any particular situation. We believe that the significance of the present research does not lie in an argument over which rotational model is most "basic." Rather, it is the integrative model itself that is of greatest significance.

References

Alba, J. W., & Hasher, L. (1983). Is memory schematic? *Psychological Bulletin, 93,* 203–231.

Buss, D. M. (1984). Evolutionary biology and personality psychology: Toward a conception of human nature and individual differences. *American Psychologist, 39,* 1135–1147.

Cattell, R. B., Eber, H. W., & Tatsuoka, M. M. (1970). *Handbook for the Sixteen Personality Factor Questionnaire (16 PF).* Champaign, IL: Institute for Ability and Personality Testing.

Clark, L. A., & Watson, D. (1988). Mood and the mundane: Relations between daily life events and self-reported mood. *Journal of Personality and Social Psychology, 54,* 296–308.

Costa, P. T., Jr., & McCrae, R. R. (1980). Influence of extraversion and neuroticism on subjective well-being: Happy and unhappy people. *Journal of Personality and Social Psychology, 38,* 668–678.

Costa, P. T., Jr., & McCrae, R. R. (1984). Personality as a lifelong determinant of well-being. In C. Z. Malatesta & C. E. Izard (Eds.), *Emotion in adult development* (pp. 141–157). Beverly Hills: Sage.

Costa, P. T., Jr., & McCrae, R. R. (1985). *The NEO Personality Inventory Manual.* Odessa, FL: Psychological Assessment Resources.

Diener, E. F. (1987, May). *Emotional reactivity as a temperament characteristic.* Paper presented at the annual meeting of the Midwest Psychological Association, Chicago.

Diener, E., & Iran-Nejad, A. (1986). The relationship in experience between various types of affect. *Journal of Personality and Social Psychology, 50,* 1031–1038.

Diener, E., Larsen, R. J., Levine, S., & Emmons, R. A. (1985). Intensity and frequency: Dimensions underlying positive and negative affect. *Journal of Personality and Social Psychology, 48,* 1253–1265.

Diener, E., Sandvik, E., & Pavot, W. (1989). Happiness is the frequency, not intensity, of positive versus negative affect. In F. Strack, M. Argyle, & N. Schwarz (Eds.), *The social psychology of well-being.* New York: Pergamon Press.

Emmons, R. A., & Diener, E. (1986). Influence of impulsivity and sociability on subjective well-being. *Journal of Personality and Social Psychology, 50,* 1211–1215.

Eysenck, H. J. (1981). General features of the model. In H. J. Eysenck (Ed.), *A model for personality* (pp. 1–37). New York: Springer-Verlag.

Eysenck, H. J., & Eysenck, M. W. (1985). *Personality and individual differences: A natural science approach.* New York: Plenum Press.

Eysenck, H. J., & Eysenck, S. B. G. (1975). *Manual of the Eysenck Personality Questionnaire.* San Diego, CA: Hodder & Staughton/DIGITS.

Eysenck, S. B. G., Barrett, P., Spielberger, C., Evans, F. J., & Eysenck, H. J. (1986). Cross-cultural comparisons of personality dimensions: England and America. *Personality and Individual Differences, 7,* 209–214.

Eysenck, S. B. G., Eysenck, H. J., & Barrett, P. (1985). A revised version of the psychoticism scale. *Personality and Individual Differences, 6,* 21–29.

Fridhandler, B. M. (1986). Conceptual note on state, trait, and the state–trait distinction. *Journal of Personality and Social Psychology, 50,* 169–174.

Gotlib, I. H., & Meyer, J. P. (1986). Factor analysis of the Multiple Affect Adjective Check List: A separation of positive and negative affect. *Journal of Personality and Social Psychology, 50,* 1161–1165.

Gough, H. G. (1975). *California Psychological Inventory Manual.* Palo Alto, CA: Consulting Psychologists Press.

Gray, J. A. (1972). The psychophysiological nature of introversion–extraversion: A modification of Eysenck's theory. In V. D. Nebylitsyn & J. A. Gray (Eds.), *Biological bases of individual behavior* (pp. 182–205). London: Academic Press.

Gray, J. A. (1981). A critique of Eysenck's theory of personality. In H. J. Eysenck (Ed.), *A model for personality* (pp. 246–276). New York: Springer-Verlag.

Izard, C. E. (1977). *Human emotions.* New York: Plenum Press.

Jackson, D. N. (1967). *Personality Research Form manual.* Goshen, NY: Research Psychologists Press.

Kiesler, D. J. (1983). The 1982 Interpersonal Circle: A taxonomy for complementarity in human transactions. *Psychological Review, 90,* 185–214.

Larsen, R. J., & Diener, E. (1985). A multitrait–multimethod examination of affect structure: Hedonic level and emotional intensity. *Personality and Individual Differences, 6,* 631–636.

Larsen, R. J., Diener, E., & Cropanzano, R. S. (1987). Cognitive operations associated with the characteristic of intense emotional responsiveness. *Journal of Personality and Social Psychology, 53,* 767–774.
McKenzie, J. (1988). Three superfactors in the 16PF and their relation to Eysenck's P, E, and N. *Personality and Individual Differences, 9,* 843–850.
Meddis, R. (1972). Bipolar factors in mood adjective checklists. *British Journal of Social and Clinical Psychology, 11,* 178–184.
Meites, K., Lovallo, W., & Pishkin, V. (1980). A comparison of four scales for anxiety, depression, and neuroticism. *Journal of Clinical Psychology, 36,* 427–432.
Rummel, R. J. (1970). *Applied factor analysis.* Evanston, IL: Northwestern University Press.
Russell, J. A. (1978). Evidence of convergent validity on the dimensions of affect. *Journal of Personality and Social Psychology, 36,* 1152–1168.
Russell, J. A. (1979). Affective space is bipolar. *Journal of Personality and Social Psychology, 37,* 1161–1178.
Russell, J. A., & Ridgeway, D. (1983). Dimensions underlying children's emotion concepts. *Developmental Psychology, 19,* 795–804.
Tanaka-Matsumi, J., & Kamoeka, V. A. (1986). Reliabilities and concurrent validities of popular self-report measures of depression, anxiety, and social desirability. *Journal of Consulting and Clinical Psychology, 54,* 328–333.
Tellegen, A. (1985). Structures of mood and personality and their relevance to assessing anxiety, with an emphasis on self-report. In A. H. Tuma & J. D. Maser (Eds.), *Anxiety and the anxiety disorders* (pp. 681–706). Hillsdale, NJ: Erlbaum.
Warr, P., Barter, J., & Brownbridge, G. (1983). On the independence of positive and negative affect. *Journal of Personality and Social Psychology, 44,* 644–651.
Watson, D. (1988a). Intraindividual and interindividual analyses of positive and negative affect: Their relation to health complaints, perceived stress, and daily activities. *Journal of Personality and Social Psychology, 54,* 1020–1030.
Watson, D. (1988b). The vicissitudes of mood measurement: Effects of varying descriptors, time frames, and response formats on measures of positive and negative affect. *Journal of Personality and Social Psychology, 55,* 128–141.
Watson, D. (1988c). [Assessing PA and NA: Factor scores]. Unpublished raw data.
Watson, D., & Clark, L. A. (1984). Negative affectivity: The disposition to experience aversive emotional states. *Psychological Bulletin, 96,* 465–490.
Watson, D., Clark, L. A., & Tellegen, A. (1984). Cross-cultural convergence in the structure of mood: A Japanese replication and a comparison with U.S. findings. *Journal of Personality and Social Psychology, 47,* 127–144.
Watson, D., & Tellegen, A. (1985). Toward a consensual structure of mood. *Psychological Bulletin, 98,* 219–235.
Wiggins, J. S. (1979). A psychological taxonomy of trait-descriptive terms: The interpersonal domain. *Journal of Personality and Social Psychology, 37,* 395–412.
Zevon, M. A., & Tellegen, A. (1982). The structure of mood change: An idiographic/nomothetic analysis. *Journal of Personality and Social Psychology, 43,* 111–122.
Zuckerman, M. (1979). *Sensation seeking: Beyond the optimal level of arousal.* Hillsdale, NJ: Erlbaum.
Zuckerman, M., Kuhlman, D. M., & Camac, C. (1988). What lies beyond E and N? Factor analysis of scales believed to measure basic dimensions of personality. *Journal of Personality and Social Psychology, 54,* 96–107.

Received June 10, 1987
Revision received February 21, 1989
Accepted March 21, 1989 ■