Folk Concepts, Natural Language, and Psychological Constructs: The California Psychological Inventory and the Five-Factor Model

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ABSTRACT Both the California Psychological Inventory (CPI; Gough, 1987) and the five-factor model of personality have roots in folk concepts of personality. The present article offers a conceptual analysis of CPI scales in terms of the five-factor model. In the first study, judges rated the item content of CPI scales in terms of the five factors. In the second, CPI scales were correlated with the factors as measured by the NEO Personality Inventory (NEO-PI; Costa & McCrae, 1985b) in a sample of 348 men and women ages 19 to 92. Both studies showed meaningful links between CPI scales and four of the factors; Agreeableness appeared to be underrepresented in CPI scales. The utility of systematic rational item analysis in terms of the five factors and the evolving relation of folk concepts to psychological constructs are discussed.

Some personality constructs—such as ego strength (Barron, 1953) or field dependence (Witkin, Dyk, Paterson, Goodenough, & Karp, 1962)—are rooted in formal personality theories remote from common

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experience. Others, including anxiety, anger, and curiosity (Spielberger et al., 1979), are familiar to both psychologists and laypersons. Gough's (1957, 1987) California Psychological Inventory (CPI) is perhaps the only omnibus personality inventory designed specifically to measure *folk concepts*: "[T]he kind of everyday variables that ordinary people use in their daily lives to understand, classify, and predict their own behavior and that of others" (Gough, 1987, p. 1). Constructs derived from this orientation should be easily understood by both experts and laypersons, and their appearance in many cultures—a criterion that Gough employs to identify true folk concepts—suggests that they must have considerable utility.

Gough's approach has many resemblances to that of lexical researchers (John, Angleitner, & Ostendorf, 1988), who regard natural language as the repository of culturally shared conceptions of personality. Research in this tradition has resulted in the identification of five major factors in English, German, and Chinese trait adjectives (McCrae & John, 1992). These five factors—Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A), and Conscientiousness (C)—have also been shown to underlie many scales derived from personality theory (e.g., Borkenau & Ostendorf, 1989; Boyle, 1989), and questionnaire measures of the factors have been developed (Costa & McCrae, 1985b; Hogan, 1986). Johnson (1987) and Lanning and Gough (1991) have suggested correspondences between CPI scales and some of the five factors.

In fact, however, there are important differences between the two approaches that make their correspondence an interesting empirical question. Gough created scales to measure specific folk concepts he himself selected; lexical researchers have attempted to select adjectives which would be representative of the full range of traits in the natural language (Peabody, 1987). Gough's scales are intended to mirror folk concepts faithfully: "If independence, for example, carries folk notions of both self-sufficiency and distance or aloofness, then the CPI scale for this social theme must do the same" (p. 3). By contrast, the major dimensions identified by lexical researchers are based on empirically observed covariation among trait adjectives: Although the traits themselves are derived from natural language, the five factors underlying these traits are not necessarily recognizable as folk concepts. An examination of relations between the CPI and the five-factor model would allow an assessment of the comprehensiveness of Gough's choice of folk concepts and an interpretation of the CPI scales in terms of a widely shared model of personality.

The great strength of the CPI is its demonstrated ability to predict behavior and social reputation. Items were selected to make such predictions, and careful cross-validation for most of the scales confirmed their utility. During the 1970s, when traits were out of favor in mainstream personality psychology, the pragmatic utility of the CPI kept it in use, and—ironically, given Gough's position—Hogan, DeSoto, and Solano (1977) relied on CPI data in their influential defense of traits. Links between the CPI and the five personality factors would help anchor the five factors in empirical findings and suggest possible applications in such areas as educational psychology, where the CPI has been used extensively.

Approaches to Relating the CPI and the Five-Factor Model

Previous studies relating the five-factor model to alternative systems of personality structure have relied heavily on joint factor analysis (Borkenau & Ostendorf, 1989; McCrae & Costa, 1985). In a preliminary analysis of the CPI, McCrae (1988) reported a joint analysis of the folk concept and vector scales of the revised CPI with factors from the NEO Personality Inventory (NEO-PI; Costa & McCrae, 1985b, 1989a). Five factors had eigenvalues greater than 1.0; after varimax rotation, each factor was marked by one of the NEO-PI factors, and four of the factors were also defined by CPI scales.

However, joint factor analysis may not be an appropriate way to approach an analysis of the CPI. There is considerable item overlap among CPI scales, so relations among the scales are influenced by correlated error. There may be good theoretical or empirical reasons for keying a given item for several scales, but a factor analysis of the resulting set of scales may be substantially distorted. Simple correlations between CPI scales and external criteria are less affected by item overlap.

At another level, it can be questioned whether a joint factor analysis makes conceptual sense. Traditionally, factor analysis has been used to examine the structure of personality traits, and such an approach may suggest that CPI variables are appropriately regarded as traits. Although many psychologists do employ CPI scales as trait measures, Gough himself is not a trait psychologist and does not assume that folk concepts represent traits (Magargee, 1972). He views CPI scales as closer in nature to the scales of the Strong Vocational Interest Blank (SVIB), and has argued that high scores on, say, the CPI Dominance scale no more necessarily imply that an individual is dominant or possesses the trait

of dominance than that high scores on the Minister scale of the SVIB show that one has a trait of ministerialism (Gough, 1968). CPI scores are supposed to be useful in predicting how individuals will act and be regarded by others, but they often do not—and, Gough maintains, need not—meet the usual requirements of trait measures.

Traits are usually defined as consistent patterns of individual differences in thoughts, feelings, and behaviors. The items in trait scales are intended to sample these thoughts, feelings, and behaviors, and internal consistency in the scale should reflect the consistent operation of the trait. Although the empirical criterion-group strategy by which most of the CPI scales were developed ensures that its scales will differentiate among relevant groups, it does not necessarily yield homogeneous item sets. In fact, the internal consistency reliabilities of CPI scales are very modest in view of the large number of items per scale. The average interitem correlations (calculated from the alpha coefficients for the total college sample [Gough, 1987, p. 32]) range from .04 to .11, suggesting that item content must be quite heterogeneous. This diversity of item content may be valuable in predicting complex criteria such as social participation or academic achievement, but it makes conceptual interpretation of CPI scales difficult.

A Five-Factor Approach to Conceptual Analysis

Gough's own method of understanding CPI scales is a four-step process he calls *conceptual analysis* (Gough, 1965, 1987). In Step 1, the objectives and development of the scale are reviewed; in Step 2, the item content is scrutinized; in Step 3, correlations with other measures are examined; and in the final step, descriptive information on high and low scorers from external observers is examined. The first two steps are essentially rational; the last two, empirical.

Reading the items in a scale—Step 2—is a simple and straightforward way to understand what the scale measures, but the rational interpretation of item content has several limitations. Item interpretation can be idiosyncratic or biased by theoretical perspective: "I am afraid of deep water" would be construed very differently by a Freudian, an Allportian, and a Jungian. Further, when scales contain quite disparate item content (as many CPI scales do), the psychological meaning of the scale as a whole may not be clear. Different judges may emphasize different aspects of the item content in their interpretations.

Content analyses provide a more systematic and consensual basis for

examining item content. Tellegen and Waller (in press), for example, reported a content analysis of the scales of the Multidimensional Personality Questionnaire (MPQ), in which content similarity judgments from a group of psychology graduate students were used to identify clusters of similar items; the MPQ scales were then characterized by these clusters. The resulting characterizations, of course, must themselves be interpreted by the reader, and do not necessarily link the scales to familiar psychological constructs.

One way to deal with these problems is by classification of individual items in terms of the widely shared conceptual framework of the five-factor model (cf. Hogan & Johnson, 1981). John (1989a) has shown that judges can reliably agree on the classification of adjectives in terms of the five-factor model, so the constructs these factors represent must be consensual. Judgments of individual items can be combined to make predictions about the scale as a whole. If a scale consists of three E items and two A items, we would expect it to measure agreeable extraversion and to show positive correlations with these two—and only these two—dimensions. If the scale has one item from each of the five factors, we would not expect substantial correlations with any of them.

This item-by-item interpretation has several advantages. When judges are blind to scale assignments, their rational interpretations cannot be biased by scale labels. When more than one judge uses the same categories for item classification, reliability of the judgments can be assessed. And when all items are judged in terms of all factors, the rational interpretations can be easily quantified. These procedures thus begin to move Gough's Step 2 away from subjective impression formation toward objective analysis.

However, such an analysis would be incomplete without additional empirical analyses. Judges might agree on the manifest content of items, but individuals who complete the inventory might respond to item format or desirability. Base rates of endorsement of items are difficult to take into account in rational judgments, but can have profound effects on observed correlations. The CPI item "I would never go out of my way to help another person if it meant giving up some personal pleasure" is a clear marker of low Agreeableness, but in a normal sample it may be endorsed so infrequently that it contributes little variance to the scales for which it is keyed. For these reasons, if the construct validity of the scales as they are actually used is at issue, correlations of CPI scales with measures of the five-factor model are needed to confirm or qualify rational interpretations.

Gough's Steps 3 and 4 distinguish between self-report data and ob-

server rating data. Although the use of both these sources is valuable, recent research suggests that the two methods of measurement are likely to give similar results when parallel instruments are used (e.g., McCrae & Costa, 1989c; Piedmont, McCrae, & Costa, 1991). From the perspective of the five-factor model a somewhat different two-stage empirical analysis might be preferable. In the first, scales can be related to the five broad factors themselves. The results will describe the CPI scales in terms of very general dimensions of personality. But broad factors by definition emcompass a variety of more specific traits, and a more detailed understanding of CPI scales can be obtained in a second stage of empirical analysis by correlating them with specific facets of the broad factors. The value of analysis at this level has recently been noted (Briggs, 1989).

Study 1: Rational Analyses

METHOD

Based on the descriptions of the factors given in McCrae and Costa (1987, pp. 86–89), four judges—an undergraduate psychology major, a psychology graduate student, and two personality psychologists (RRM and RLP)—rated each of the 480 CPI items on a 5-point scale from −1 (strongly contraindicative) to 1 (strongly indicative) by .5 increments for each of the five factors. Thus, the item "I enjoy social gatherings just to be with people" received ratings of 1 from all four judges on E, because it was clearly an indicator of Extraversion; it received ratings of 0, 0, 0, and −.5 on N, because it was conceptually unrelated to Neuroticism. Ratings on each dimension were independent, so items might be considered indicative of two or more factors, or of none of the factors. Judges were blind to the scale assignments of the items and worked independently.

For each factor, ratings were correlated for each of the six pairs of judges across the 480 items. Correlations ranged from .23 to .74 (median = .56), all significant at $p < .001$. Across judges, the largest median correlations were seen for E and C (both .65); the smallest for O (.42) and A (.44). This might suggest that factors E and C are more easily rated, or that these factors are more unambiguously represented in CPI items. Across all five factors, the highest agreement was found between the two personality psychologists (median = .68), suggesting that increased familiarity with the constructs may lead to more accurate rational interpretation of items.

Although the 1957 CPI test booklet was used, the revised CPI scales (Gough, 1987) were scored from it. The revised version has 20 folk concept scales and three vectors that summarize major themes across the scales. Application of

the scoring keys to the 480 item ratings and division by the number of items in the scale give an estimate of the proportion of item content relevant to each of the five factors in each CPI scale. For example, if a 10-item scale had four items rated 1 on C, three rated .5, and the remaining items rated 0 on C, and if these were all keyed in the positive direction, the estimated proportion of C content in the scale would be .55.

These proportions were computed for each judge; across the 23 scales, the intraclass correlations of these values were .57 for N, .96 for E, .59 for O, .71 for A, and .88 for C, suggesting moderate to good agreement. The mean ratings from the four judges were used as indicators of the rational content of the scales. Note that these values need not sum to 100% for a scale, because some items may be unrelated to any of the five factors. Using the Spearman-Brown formula, the reliability of the composites ranged from .84 for ratings of N content to .99 for ratings of E content.

RESULTS AND DISCUSSION

Table 1 gives results of the rational analyses of the CPI, showing the proportion of item content in each scale that is related to each of the five factors. For example, the first line of the table suggests that items on the CPI Dominance scale are most likely to consist of E-related content, followed by content assessing (low) N and C. Some of the scales (e.g., Communality and Masculinity/Femininity) do not appear to be strongly related to any of the five factors, but most appear to be saturated by content from one or more factors. Reading down the columns, it appears that Good Impression, Well-Being, and Vector 3, Realization, are most saturated with N content, although they are scored in the opposite direction. Dominance, Sociability, Social Presence, and (low) Vector 2, Internality, have the most E-related item content. Fewer scales have clear O or A content; Achievement via Independence and Flexibility are most related to O, whereas Self-Control and Good Impression are most related to A. Note, however, that all four of these scales are more saturated with content from one of the other factors. Finally, Responsibility, Achievement via Conformance, (low) Flexibility, and Vector 2, Norm-Favoring, appear to be most directly related to C in these rational analyses.

Three conclusions can be drawn from these analyses. First, there appear to be interpretable correspondences between the constructs measured by CPI scales and item content. A sociability scale ought to include chiefly items related to E, and the CPI Sociability scale does so. Similarly, Responsibility and Norm-Favoring should be measured

Table 1
Mean Rated Proportion of California Psychological Inventory (CPI) Item Content Related to the Five Factors

CPI scale	Factor				
	N	E	O	A	C
Dominance	.19 (−)	**.36**	.06	.06 (−)	.17
Capacity for Status	.22 (−)	.17	.19	.09	.01
Sociability	.13 (−)	**.50**	.15	.02	.09
Social Presence	.12 (−)	**.36**	.16	.01	.03 (−)
Self-Acceptance	.07 (−)	**.30**	.16	.02 (−)	.00
Independence	**.31** (−)	.13	.05	.13 (−)	.03
Empathy	.11 (−)	.21	.18	.12	.09 (−)
Responsibility	.14 (−)	.01 (−)	.06	.17	**.30**
Socialization	.23 (−)	.01	.01 (−)	.07	.15
Self-Control	**.33** (−)	.20 (−)	.03 (−)	.22	.12
Good Impression	**.36** (−)	.03 (−)	.05	.25	.18
Communality	.13 (−)	.05	.11	.04	.18
Well-Being	**.59** (−)	.04	.02	.12	.10
Tolerance	.25 (−)	.02	.13	.19	.05
Achievement via Conformance	.19 (−)	.01 (−)	.02	.06	**.37**
Achievement via Independence	.26 (−)	.01	.24	.06	.02
Intellectual Efficiency	**.31** (−)	.05	.15	.04	.07
Psychological Mindedness	.24 (−)	.03	.13	.02 (−)	.04
Flexibility	.12 (−)	.08	.22	.08	**.37** (−)
Masculinity/Femininity	.17	.07 (−)	.02	.10	.03
Internality (Vector 1)	.00	**.55** (−)	.11 (−)	.06	.09 (−)
Norm-Favoring (Vector 2)	.08 (−)	.03	.03 (−)	.04	**.38**
Realization (Vector 3)	**.41** (−)	.01	.14	.20	.01

Note. Negative values indicate that CPI scale content is scored in the direction of the low pole of the factor. Values over |.30| are given in boldface. N = Neuroticism; E = Extraversion; O = Openness to Experience; A = Agreeableness; C = Conscientiousness.

by items measuring C, and apparently they are. Once it is understood that Gough's Self-Control scale is intended to measure in part "freedom from . . . self-centeredness" (Gough, 1957, p. 10), the presence of A-related item content in that scale is understandable.

Second, it is clear from Table 1 that relatively few CPI scales are univocal in content with respect to the five factors. Dominance blends

N, E, and C items; Capacity for Status includes N, E, and O content. This finding is consistent with the relatively low internal consistencies of CPI scales. These results can be viewed as hypotheses for empirical confirmation, and suggest that many CPI scales will be correlated with several factors and that the best predictor of most CPI scales will be some combination of the five factors.

Third, it appears that the items in CPI scales reflect primarily aspects of N, E, and C. Given the origin of many CPI scales in analyses of Minnesota Multiphasic Personality Inventory (MMPI) items, the presence of N is understandable. The inclusion of E and C is also consistent with Gough's concern for social interaction and norm-following. The relative absence of O and A item content is puzzling. Several scales—including Empathy, Independence, Tolerance, Achievement via Independence, Psychological Mindedness, and Flexibility—would be expected to have O content, but from reading the items this was not obvious to these judges. The domain of A is clearly relevant to interpersonal interaction because it forms one axis of the interpersonal circumplex (Trapnell & Wiggins, 1990), but it seems to be underrepresented in Gough's choice of folk concepts.

Study 2: Empirical Analyses

Steps 3 and 4 of Gough's conceptual analysis call for an examination of empirical correlates of scales. Factors and facet scales from the NEO-PI can be used to assess CPI scales from the perspective of the five-factor model.

METHOD

Subjects

Subjects were either volunteer participants in the Baltimore Longitudinal Study of Aging (BLSA; Shock et al., 1984) or adults originally recruited as peer raters of BLSA participants (see McCrae & Costa, 1987, for details). Both groups consisted of generally healthy, well-educated, community-dwelling volunteers. Complete data were obtained from 153 men, ages 27 to 92, and from 195 women, ages 19 to 89.

Measures and Procedure

In 1986, subjects completed the NEO-PI. The NEO-PI is a 181-item questionnaire developed through rational and factor analytic methods to measure

the dimensions (or domains) of the five-factor model, as well as some of the traits (or facets) that define the factors. Items are answered on a 5-point scale ranging from *strongly disagree* to *strongly agree*, and scales are balanced to control for the effects of acquiescence. Internal consistency for the five broad domain scales ranges from .76 to .93, and scores for adults are extremely stable, with 3- to 6-year retest coefficients ranging from .63 to .83 (Costa & McCrae, 1988b). To provide an optimal operationalization of the five-factor model, NEO-PI scales were factored, and the resulting factors were rotated to maximize convergent and discriminant validity with a series of external criteria (McCrae & Costa, 1989b). These NEO-PI factors are highly correlated with their corresponding domain scales (rs = .79 to .96), but show a somewhat stronger pattern of convergent and discriminant validity, particularly for the A and C factors. Six facet scales measure more specific aspects of three of the domains—N, E, and O. These facet scales are used in the second phase of the empirical analysis.

In 1987, one year later, the subjects originally recruited as peer raters completed a set of items from which preliminary facets of A and C could be scored (Costa & McCrae, 1989b). Refined versions of these scales will be published as part of a revised NEO-PI (Costa, McCrae, & Dye, 1991).

In 1987 subjects also completed the CPI, a 480-item inventory employing a true-false format. Megargee (1972) reviewed the reliability and validity of the original CPI; extensive validational data on the revised CPI is offered in the 1987 *Administrator's Guide*. In addition to folk concept scales and broader structural scales, some of the CPI scales can be regarded as validity scales. Recent work has suggested a series of equations by which fake good, fake bad, and random responding can be detected (Gough, 1987, p. 38). When applied to the present sample of 348 subjects, the equations showed that 3 subjects were slightly above the cutoff point for fake good, but there were no other indications of protocol invalidity. All protocols were included in the analyses.

Both instruments were completed at home and returned by mail. Because personality itself is highly stable in adults over 30 (McCrae & Costa, 1990), the time interval between administration of the NEO-PI and CPI is unlikely to affect results, and guarantees that correlations between the two sets of scales are not inflated by the effects of temporary moods or recent events (Costa & McCrae, 1985a).

RESULTS AND DISCUSSION

Relations of CPI Scales to the Five Factors

Correlations between NEO-PI factors and CPI scales are given in the first five columns of Table 2 for the combined sample of men and women. It is clear that there are numerous and substantial correlations

Table 2
Correlations and Multiple Correlations between NEO Personality Inventory (NEO-PI) Factors and Revised California Psychological Inventory (CPI) Scales

CPI scale	NEO-PI factor N	E	O	A	C	Rationally weighted index	Adjusted multiple *R*
Dominance	−.25	**.55**	.25	−.23	.13	.65	.69
Capacity for Status	−.21	**.36**	**.38**	.04	.02	.54	.56
Sociability	−.23	**.64**	.28	−.02	.01	.72	.73
Social Presence	−.17	**.49**	**.42**	−.14	−.18	.64	.69
Self-Acceptance	−.07	**.56**	**.33**	−.15	.00	.65	.66
Independence	**−.42**	**.35**	**.35**	−.22	.10	.65	.69
Empathy	−.12	**.51**	**.43**	.07	−.08	.64	.68
Responsibility	−.20	−.01	.08	.19	.28	.41	.40
Socialization	−.27	.01	−.19	.14	.25	.39	.42
Self-Control	**−.37**	−.25	−.26	.28	**.31**	.61	.66
Good Impression	**−.48**	−.02	−.14	.22	**.32**	.60	.63
Communality	−.03	.23	−.01	−.14	.07	.08	.25
Well-Being	**−.45**	.16	.00	.08	.18	.50	.51
Tolerance	−.08	.07	.21	.28	.10	.32	.37
Achievement via Conformance	**−.36**	.18	.02	.02	**.37**	.50	.54
Achievement via Independence	−.17	.07	**.41**	.06	.01	.42	.45
Intellectual Efficiency	**−.30**	.14	**.32**	.05	.03	.43	.45
Psychological Mindedness	**−.31**	.05	**.33**	−.04	.07	.45	.46
Flexibility	.06	.13	**.42**	.17	**−.40**	.55	.60
Masculinity/ Femininity	**.40**	−.03	.01	**.45**	.13	.56	.60
Internality (Vector 1)	.12	**−.57**	**−.34**	.26	.05	.63	.71
Norm-Favoring (Vector 2)	−.27	−.02	−.27	−.02	**.39**	.44	.52
Realization (Vector 3)	**−.37**	.14	.26	.18	.09	.48	.52

Table 2
Continued

CPI scale	NEO-PI factor N	E	O	A	C	Rationally weighted index	Adjusted multiple *R*
Adjusted multiple *R* (males)	.57	.76	.61	.51	.64		
Adjusted multiple *R* (females)	.65	.69	.56	.54	.54		

Note. $N = 348$. For $|r| > .11$, $p < .05$; for $|r| > .17$, $p < .001$. Simple correlations over |.30| are given in boldface. N = Neuroticism; E = Extraversion; O = Openness to Experience; A = Agreeableness; C = Conscientiousness.

between the scales of the two instruments, and a comparison of Tables 1 and 2 suggests that rational analyses are generally confirmed by empirical results. Of the 115 correlations in Table 2, 105 (91%) are in the same direction as the corresponding rational rating in Table 1. Rank order correlations between the columns of the two tables show values of .79, .89, .89, .87, and .83 for N, E, O, A, and C, respectively (all significant at $p < .001$).

The correlations in Table 2 are based entirely on self-reports, but similar results have been reported by John (1989b), who correlated self-reports on the CPI from 280 respondents with measures of the five factors derived from adjectives checked by teams of raters at the Institute for Personality Assessment and Research. Of the 33 correlations given in boldface in Table 2, 30 (91%) were significantly replicated in John's study. (The three exceptions were all correlations with N, suggesting that this dimension may be perceived somewhat differently by expert raters.) As in previous research, it appears that cross-method correlations generally confirm conclusions from self-report data. Note also that John's use of adjective measures of the five factors suggests that the present results can be generalized to other operationalizations of the five-factor model.

Because many CPI scales appear to be multifactorial, stronger correlations should be found when combinations of NEO-PI factors are used. Rational analyses provide one basis for such a combination: A weighted rational index can be formed by combining the five factors in proportion to their item content ratings. Thus, Table 1 suggests that CPI Dominance would best be predicted by an index with weights of −.19, .36, .06, −.06, and .17 for N, E, O, A, and C factors, respectively.

The sixth column of Table 2 shows the correlation of these rational indices with corresponding CPI scales; in every case except Communality (which is essentially a reversed infrequency scale), these composites show a stronger correlation with the CPI scale than any of the single factors.

The results of multiple regressions, in which each CPI scale is predicted from the five NEO-PI factors, are reported in the last column of Table 2. The median multiple R is .56. These empirical combinations are usually only slightly better than the rationally weighted indices.

The most striking difference between Table 1 and Table 2 is in the Openness columns. Although the rank order correlation between these columns is high, suggesting that judges are able to predict which CPI scales are more and which less related to O, the rational ratings clearly underestimate the strength of the correlations. Empirical analyses show that O is an important component not only of measures such as Achievement via Independence and Flexibility, which we would expect to be related to O, but also of such less obviously related scales as Capacity for Status and Social Presence. These scales may contain many items that are correlates of Openness, although they are not direct expressions of it; alternatively, they may contain a few items that are particularly strong measures of O.

Table 2, like Table 1, shows a relative absence of CPI scales related to A. The only exception to this rule is Masculinity/Femininity, which is substantially correlated with A, $r = .45$. This correlation, however, is inflated by gender differences in Agreeableness. When computed for men and women separately, the correlation between Femininity and A is .33 for men and .22 for women. (In general, the results reported in Table 2 are replicated when analyses are done within sex.)

CPI scales are often combined to provide optimal prediction of external criteria. It is reasonable to ask how well the 23 CPI scales together can predict NEO-PI factor scores; multiple regressions can provide this information. The last two rows of Table 2 show adjusted multiple Rs separately for men and women; the median value is .59. Multiple correlations are lowest with the A factor, but these correlations of .51 and .54 are considerably higher than that yielded by any single CPI scale when analyses are done within sex.

CPI Scales and Facets of the Five Factors

The last stage of analysis of CPI scales within the five-factor framework is an examination of correlations with more specific facets of the

Table 3
Correlations of California Psychological Inventory (CPI) Scales with NEO Personality Inventory (NEO-PI) Facet Scales and Preliminary A and C Facet Scales

	CPI scale																					
NEO-PI scale	Do	Cs	Sy	Sp	Sa	In	Em	Re	So	Sc	Gi	Cm	Wb	To	Ac	Ai	Ie	Py	Fx	Fe	v.1	v.2	v.3
N1: Anxiety	–25	–20	–24	–18	–12	**–40**	–15	–15	–22	–24	**–35**	–14	**–40**	–06	**–31**	–13	–26	–21	08	**33**	13	–24	**–30**
N2: Hostility	00	–10	–05	07	08	–06	–05	–22	–29	**–43**	**–45**	09	**–30**	–21	–27	–12	–13	–14	00	–04	–11	–23	**–32**
N3: Depression	**–30**	–24	**–30**	–20	–15	**–41**	–18	–21	**–34**	**–31**	**–44**	–13	**–44**	–15	**–45**	–18	–28	–27	11	**33**	17	**–33**	**–35**
N4: Self-Consciousness	**–42**	**–33**	**–45**	**–35**	–24	**–51**	**–31**	–10	–07	–17	**–33**	00	**–36**	–08	–27	–14	–24	–28	–06	23	**32**	–11	**–35**
N5: Impulsiveness	–04	03	–02	09	12	–15	10	–23	–24	**–46**	**–48**	04	**–32**	–01	–29	–02	–14	–19	24	18	–11	**–32**	–21
N6: Vulnerability	**–41**	–28	**–33**	–27	–26	**–49**	–22	–18	–23	–19	**–35**	–13	**–41**	–06	**–36**	–17	**–33**	**–30**	10	**34**	28	–23	–28
E1: Warmth	29	28	**45**	21	**31**	10	**37**	13	09	–01	15	06	16	13	16	03	08	02	08	20	–26	07	15
E2: Gregariousness	**35**	27	**48**	**36**	**34**	25	**34**	06	09	–05	09	12	15	05	20	12	16	09	14	–05	**–34**	01	19
E3: Assertiveness	**69**	**35**	**52**	**39**	**52**	**51**	**41**	15	08	–15	01	15	16	02	**31**	12	20	23	04	–22	**–63**	14	17
E4: Activity	**37**	19	**31**	27	**39**	**32**	26	02	–02	–19	–01	19	11	06	17	08	09	05	–03	–04	**–38**	05	09
E5: Excitement Seeking	27	16	**31**	**43**	**34**	19	**30**	–26	–19	**–42**	–22	22	03	–09	–10	04	05	03	14	**–37**	**–43**	–19	–05
E6: Positive Emotions	**33**	**30**	**48**	**42**	**43**	25	**46**	–06	–06	–23	–08	13	08	17	04	08	14	04	22	06	**–41**	–15	15
O1: Fantasy	08	15	17	**34**	22	09	29	–11	–21	**–34**	–26	00	–13	07	–17	17	11	09	**42**	06	–25	**–32**	04
O2: Aesthetics	14	**33**	29	29	23	18	**36**	03	–16	–20	–09	–01	–04	21	00	22	14	15	29	21	–19	–20	18
O3: Feelings	**31**	29	**39**	**38**	**39**	19	**42**	–04	–14	**–31**	–21	13	–03	09	–01	16	15	07	**30**	19	**–37**	–23	08

O4: Actions	26	**32**	**39**	**33**	**32**	**34**	**37**	14	–03	–05	04	–01	16	16	12	**30**	28	24	**37**	07	–27	–18	**30**
O5: Ideas	**33**	**37**	**31**	**31**	**32**	**31**	**35**	21	–01	–13	05	05	09	14	25	**33**	28	**34**	17	–15	**–35**	00	25
O6: Values	19	**33**	20	**41**	24	**32**	**40**	03	–15	–16	–11	–02	05	25	–04	**43**	**33**	28	**42**	–02	–26	**–30**	29
A1: Trust	21	25	**31**	16	20	29	**31**	**38**	22	28	**31**	16	**37**	**48**	28	29	**35**	17	17	14	–06	06	**49**
A2: Straightforwardness	–11	00	–01	–21	–14	02	–03	29	20	**46**	**42**	–08	22	23	16	05	06	03	–15	21	**31**	16	23
A3: Altruism	–14	–05	02	–08	–09	–10	02	07	20	**30**	26	00	15	06	07	–06	–02	–12	08	**34**	18	00	08
A4: Compliance	–27	–11	–08	–22	–20	–14	–07	12	16	**43**	**31**	–13	14	14	14	03	–05	–08	06	25	**31**	04	16
A5: Modesty	–24	–11	–13	**–31**	–21	–20	–17	01	02	**30**	**30**	–07	09	00	–06	–14	–10	–05	–12	14	**36**	14	00
A6: Tender-Mindedness	06	12	13	07	11	02	18	23	05	07	07	06	01	**30**	03	13	07	07	15	23	–06	–07	19
C1: Competence	**51**	20	**37**	27	**30**	**49**	25	23	**31**	25	**34**	**30**	**40**	00	**56**	17	22	26	–16	–21	**–32**	**33**	26
C2: Order	22	15	20	08	12	13	03	09	12	10	20	22	24	05	23	00	06	00	**–35**	–07	–11	28	12
C3: Dutifulness	25	19	22	–03	11	21	08	**36**	27	**37**	**39**	10	28	19	**43**	14	17	20	**–33**	–09	–05	**40**	22
C4: Achievement Striving	**40**	20	**31**	15	**31**	**30**	13	28	19	09	25	24	24	07	**49**	12	10	20	–29	–09	**–30**	**43**	15
C5: Self-Discipline	**43**	24	**37**	18	24	**39**	21	**32**	**33**	**32**	**43**	27	**41**	15	**57**	21	24	28	–28	–17	–22	**45**	**30**
C6: Deliberation	15	18	10	–05	09	08	05	23	24	18	16	12	10	08	**31**	13	14	13	–26	–16	–06	**34**	07

Note. Decimal points are omitted; correlations over |.30| are given in boldface. For N, E, and O facets, $N = 348$; for $|r| > .11$, $p < .05$; for $|r| > .13$, $p < .01$; for $|r| > .17$, $p < .001$. For preliminary A and C facets, $N = 212$; for $|r| > .14$, $p < .05$; for $|r| > .17$, $p < .01$; for $|r| > .21$, $p < .001$. N = Neuroticism; E = Extraversion; O = Openness to Experience; A = Agreeableness; C = Conscientiousness. Do = Dominance; Cs = Capacity for Status; Sy = Sociability; Sp = Social Presence; Sa = Self-Acceptance; In = Independence; Em = Empathy; Re = Responsibility; So = Socialization; Sc = Self-Control; Gi = Good Impression; Cm = Communality; Wb = Well-Being; To = Tolerance; Ac = Achievement via Conformance; Ai = Achievement via Independence; Ie = Intellectual Efficiency; Py = Psychological Mindedness; Fx = Flexibility; Fe = Masculinity/Femininity; v.1 = Vector 1, Internality; v.2 = Vector 2, Norm-Favoring; v.3 = Vector 3, Realization.

five broader domains. Table 3 reports correlations between the CPI scales and the N, E, and O facet scales of the NEO-PI, and preliminary A and C facet scales. These findings allow important distinctions between CPI scales. Dominance and Social Presence, for example, show similar correlations with the overall E factor in Table 2. However, Dominance is strongly associated with only one facet of E, Assertiveness ($r = .69$), whereas Social Presence is related to Excitement Seeking, Positive Emotions, and Gregariousness as well as Assertiveness, and appears to be a more general measure of E. Both Achievement via Independence and Flexibility are related to O, but the former is more strongly related to Openness to Ideas, the latter to Openness to Fantasy. These differences are consistent with the intentions of the scales and contribute to their construct validity.

The 690 correlations in Table 3 cannot be discussed in detail, but it is worthwhile to focus attention on the three structural scales or vectors because they are less familiar than the folk concept scales and are now used to organize interpretive reports on the CPI. The first vector, Internality, is negatively related to all the E facets, but especially Assertiveness. In addition, high scorers on this vector are self-conscious and vulnerable, though not hostile or impulsive; they are also closed to many aspects of experience. Preliminary A and C facet scales suggest that Internality is also related to Modesty and a low sense of Competence. This pattern of correlations suggests that Internality is not simply Introversion, but a timid, constricted, and inhibited form of Introversion.

The second vector, Norm-Favoring, is chiefly related to facets of C, especially Dutifulness, Achievement Striving, and Self-Discipline. It shows fewer strong associations with N, E, O, and A facets, but high scorers on this vector appear to be generally well-adjusted and relatively closed to experience, although not necessarily closed to Ideas.

The third vector, Realization, is intended to measure the extent to which each individual realizes his or her potential: "Persons scoring high on v.3 should be reflective, capable, and optimistic concerning their present and future status" (Gough, 1987, p. 16). In the present sample, high scorers are low on all facets of N, and tend to be high on Openness to Actions, Ideas, and Values; they are also trusting and high in Self-Discipline. The low correlations seen with Positive Emotions and Openness to Feelings suggest that the capacity for joy and a rich emotional life are not an integral part of Gough's concept of realization, as they might be for humanistic psychologists.

GENERAL DISCUSSION

It appears from both rational and empirical analyses that (with the exception of Communality) Gough's folk concept scales are all meaningfully related to one or more of the five factors found in the analysis of natural languages. If these five factors are indeed the major dimensions of personality, any good personality inventory must measure them; thus, given the extensive research on which the CPI was based and its demonstrated utility in a number of contexts over the past 30 years, the concordance between the two systems cannot be considered very surprising.

It does, however, call into question the view that the CPI measures something other than traits. CPI scales measure individual differences in behavioral tendencies; they are highly stable over time (Block, 1977); they can be interpreted in terms of the same basic factors that underlie lay trait terms. If the folk concepts of the CPI are not themselves traits, they are at least closely related variables; in some cases they may usefully be interpreted as combinations of traits. Although these combinations may faithfully represent folk concepts, they also create psychometric difficulties because the same scores may be obtained by individuals in very different ways (see Briggs & Cheek, 1986). These problems cannot be avoided by declaring that the scales are not intended to measure traits.

Rational Analyses of Personality Measures

Psychometricians have often been skeptical of rational analysis of item content, noting that face validity is no substitute for construct validity. Yet rational approaches also have defenders. Scales constructed by rational methods tend to have comparable validity to scales constructed by empirical methods (Burisch, 1984), and factor analysts routinely interpret their factors on the basis of item content.

It is reasonable to assume that some individuals are more skilled than others in interpreting item content, and one of the objections to rational interpretation is that the skill of the interpreter is generally unknown. In the present study, a more formal approach to rational interpretation was adopted which shares some features with content analysis. Independent judges, blind to scale assignment, rated each item in terms of the five basic dimensions of personality. Interjudge agreement was moderate to high, with somewhat higher agreement seen for the two judges

most familiar with the five factors. When combined in accordance with the item-keying of the CPI scales, these rational judgments generally agreed well in direction and magnitude with observed correlations with measures of the five factors.

These results are of particular interest because many of the scales of the CPI were developed through external criterion strategies in which the rational content of the items was irrelevant: "The advantage of the external criterion method is that it transcends the intuitive ability of the test constructor and can detect discriminating items that may be far from obvious" (Megargee, 1972, p. 23). In general, however, it appears that most of the items selected by this process measure the content that they appear to reflect. (If they did not, Gough's recommendation that test users gain familiarity with the scales by reading the items would be nonsensical.) Empirical item selection strategies, at least in the development of the CPI, tended to yield scales that are also face valid, and rational interpretation of these scales can provide a useful guide to their probable empirical correlates.

Where both rational and empirical approaches are possible, the latter are of course to be preferred. In the present case, for example, rational analyses underestimated the correlations of CPI scales with Openness. However, in some instances empirical approaches are not possible. Researchers conducting literature reviews or meta-analyses, for example, must classify scales by the constructs they measure, but may find that the correlational data needed to interpret some scales are not available. The general agreement of rational and empirical approaches in the present study suggests that analysis of the item content in terms of the five factors by a panel of judges may provide a reasonable way to interpret the scale. Certainly, it is likely to be a better guide than the scale label or the author's description of what the scale was intended to measure (cf. Stone & Costa, 1990).

Reinterpreting the Literature in Applied Psychology

The CPI has been used extensively and fruitfully in many areas of applied psychology, and interpretation of CPI scales in terms of the five-factor model allows a fresh perspective on this literature. One area of particular interest is educational psychology. Megargee (1972) summarized a large body of studies showing that CPI scales contribute to the prediction of academic success above and beyond the contributions

of IQ. Achievement via Conformance was developed to differentiate low and high achievers in high school; in addition to this scale, Responsibility and Socialization scales consistently relate to grade point average (GPA). Neither of the latter two scales was originally intended to predict this criterion, but their associations with GPA can be understood by noting that Achievement via Conformance, Responsibility, and Socialization are all related to Conscientiousness. It appears that C is a crucial dimension for academic success in high school (cf. Digman & Takemoto-Chock, 1981).

Achievement via Independence was developed to assess college success, particularly for psychology students. Along with Intellectual Efficiency, Tolerance, and Psychological-Mindedness—all scales related to O—this scale tends to predict achievement best for bright high-school and college students. Because O has been related to divergent thinking abilities (McCrae, 1987), this may reflect the fact that creativity is an important element of success in higher education.

The CPI has also been used to characterize high-school dropouts, college attenders, student teachers, and individuals entering a variety of occupations. Reinterpretation of the findings in terms of the five-factor model can systematize results and allow comparisons with studies using other instruments. Further, knowledge of the traits not as well represented in the CPI—such as measures of A and the Order and Deliberation facets of C (see Table 3)—can suggest the need for supplementary scales in future research using the CPI in educational and vocational settings.

Agreeableness in the CPI

The absence of strong measures of A among CPI scales is peculiar in view of the claim that the CPI "can predict—one scale at a time or via combinations—just about everything that happens in interpersonal life" (H. Gough, personal communication, 1971, in Megargee, 1972, p. 13). Cooperation, selflessness, and altruism are aspects of A, and surely represent important features of interpersonal behavior (Graziano & Eisenberg, in press), yet they do not appear to be well represented by any CPI scale (although perhaps some combination of CPI scales would approximate them).

There is evidence in Table 3 that some specific aspects of A are related to CPI scales. For example, CPI Tolerance is related to the NEO-PI preliminary A facet scale of Trust, and CPI Self-Control is related to

Straightforwardness and Compliance. It is possible that stronger correlations would be seen with the final revised version of the NEO-PI A scales. But the lack of substantial correlations between individual CPI scales and the broad A factor is not limited to the particular measure of A used in the present study. Correlations in the CPI *Administrator's Guide* show that none of the CPI scales are strongly related to the Myers-Briggs Type Indicator T-F Continuous score nor to the Personality Research Form Nurturance scale (all $|r|s < .32$), both of which have been related theoretically and empirically to A (Costa & McCrae, 1988a; McCrae & Costa, 1989a). The *Manual* for the Adjective Check List (ACL; Gough & Heilbrun, 1983) reports correlations between ACL scales and the original (Gough, 1957) CPI scales. Several ACL scales, including Nurturance and Deference and low Autonomy, Aggression, and Critical Parent, are clearly related to A (Piedmont, McCrae, & Costa, 1991); the largest correlation of any of these scales with any of the original CPI scales is .34. John's (1989b) study of CPI scales and observer ratings on the five factors showed small correlations between rated A and all CPI scales except Femininity ($r = .27$); even smaller correlations might have been seen if analyses had been conducted separately by sex. Finally, at a quite different level of analysis, Loehlin (1987) conducted a behavior genetics analysis of 31 homogeneous, nonoverlapping item clusters from the CPI. He found four factors that appeared to have a genetic basis, and explicitly identified them with four of Norman's (1963) five factors. Conspicuously absent was the Agreeableness factor.

The relative absence of A-related items in the Socialization scale is especially troubling. This scale was developed empirically by contrasting the responses of delinquents and adult criminals with those of normal and well-socialized students and adults, and has been shown to be effective in discriminating these groups (Gough, 1960). But intuitively, it seems clear that criminals should be less cooperative, kind, and generous than normal adults (low A) as well as being low in self-discipline and adherence to social norms (low C). Both these features of poor socialization are found in Hare's (1980) Psychopathy Checklist (PCL), and Harpur, Hare, and Hakstian (1989) showed that whereas the CPI Socialization scale is related to the Chronically Unstable and Anti-Social Lifestyle factor of the PCL (low C), it is unrelated to the Selfish, Callous, and Remorseless Use of Others factor (low A). A socialization scale, particularly one intended to discriminate delinquents from good citizens, should be related to A as well as C; in this respect, the CPI Socialization scale does not seem to mirror the folk concept well.

Folk Concepts and Psychological Constructs

Tellegen and Waller (in press) have recently called attention to the distinction between folk and psychological concepts:

> In a human-behavioral discipline like personality, folk distinctions may be an indispensable and valuable starting point. But, inevitably, new concepts will be introduced. . . . As these explanatory psychological concepts mature, some folk concepts may increasingly be seen, not as basic explanatory constructs, but as social-cognitive structures to be explained.

This premise is consistent with the history of other sciences. Whales were classified as fish for centuries because they lived in the water; modern biologists realize that in most significant respects whales better resemble land mammals. The glove anesthesias seen in classical hysterias make sense in terms of folk anatomy, but not scientific neurology. How well do folk concepts in personality psychology match contemporary psychological constructs?

In general, it appears that there is substantial overlap. The five dimensions of personality recovered from analyses of natural languages strongly resemble the dimensions recovered from analyses of questionnaires based on theories of personality (McCrae, 1989). Gough's version of folk concepts, as embodied in CPI scales, are also clearly related to these factors.

Yet there are also notable points of difference, instances in which psychological constructs extend or even contradict folk concepts. Common sense tells us that happiness is the polar opposite of unhappiness—but psychological research shows that the dispositions to be happy and unhappy are orthogonal (Costa & McCrae, 1980; Watson & Tellegen, 1985). McCrae (1990) has argued that important traits in the domain of Openness to Experience are not well represented in English trait adjectives, and that the characterization of this factor in lexical studies is correspondingly limited. Gough himself departed from his original folk concepts, as Megargee (1972) noted:

> Gough's conceptual analysis of a scale is used to refine its original meaning and interpretation. In the process, of course, the scale may drift away somewhat from the original folk concept that inspired it. Whereas achievement is certainly a folk concept, the distinction between achievement via conformance and independence is not as firmly rooted in the popular ethos. (p. 77)

We expect science to improve on common sense, and it is tempting to gauge the development of a branch of science by the gap between its theories and conventional wisdom. By this measure, quantum mechanics is a very advanced science, personality psychology a very primitive one. But another view of the same situation suggests that folk concepts of subatomic physics are primitive, whereas folk concepts of personality traits are highly sophisticated. Given the importance of personality in everyday life and the familiarity of human nature to human beings, this latter conclusion is plausible.

Further, folk concepts are capable of evolution and development. Wiggins (1991) cites a study by Benjafield and Carson (1985) on the historical origins of trait terms that define the interpersonal circumplex. Terms defining the axes of Status and Love have been in the English language about a century longer than terms defining the alternative axes that correspond more closely to E and A. Wiggins interprets this as evidence that Status and Love are more basic dimensions of personality; an alternative view is that they are more primitive dimensions. Perhaps in the Middle Ages distinctions between lord and serf and friend and foe were sufficient to characterize interpersonal relationships; over time, trait labels were evolved to represent more intrinsically personological constructs such as gregariousness and modesty.

The relation between folk concepts and psychological constructs is thus a fluid one. Scientific psychology can begin with an analysis of folk concepts, but must be prepared to refine or dispute them. At the same time, commonsense views of human nature are likely to evolve as a result of the popular dissemination of psychological constructs.

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