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Measures of five aspects of affective well-being at work

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ABSTRACT

Validation evidence is provided for scales that measure five aspects of affective well-being in relation to the work context: anxiety–comfort, depression–pleasure, bored–enthusiastic, tiredness–vigour and angry–placid. Confirmatory factor analysis is used to test four alternative structures for the items in the scales in two samples (n = 871, n = 1915). Analyses in both samples support one structure. The final scales have acceptable internal reliability. The unique explanatory power of each scale is suggested by partial correlations with theoretically related variables. Confirmatory factor analysis indicates that the five factor solution has a better fit with the data than other first order solutions with fewer factors. Second order factor analysis shows that two superordinate factors, corresponding to negative and positive affect, can account for the relationships amongst the five first order factors.

KEY WORDS

affect ▪ confirmatory factor analysis ▪ well-being

Introduction

There is a long tradition of organizational theory that emphasizes the importance of psychological well-being (e.g. Mayo, 1933). Measurement of psychological well-being has been hindered in two ways. First, some measures used by organizational researchers confound well-being with cognitive processes that influence well-being (Newton, 1989). Second, work-related psychological well-being has often been narrowly operationalized as job satisfaction (e.g. Clegg & Wall, 1981). One approach that overcomes these weaknesses is to assess affective well-being. Affective well-being reflects the frequent experience of positive affects and infrequent experience of negative affects (Diener & Larsen, 1993). Whilst psychological well-being consists of a number of components, including affective well-being, competence, aspiration, autonomy, integrative functioning and satisfaction (Andrews & McKennell, 1980; Diener, 1984; Warr, 1990a, 1994; Ryff & Keyes, 1995), measures of affective well-being are amongst the most important, if not *the* most important, indicators of psychological well-being (Diener & Larsen, 1993; Warr, 1994). Affective well-being is multi-dimensional, and can potentially capture subtleties, complexities and changes in the experience of work that general, uni-dimensional measures may not (Briner, 1997). Affective well-being is domain specific, and can be measured in relation to the work domain (Warr, 1990a). The aims of this paper are: to derive concise indicators of affective well-being; to present validation evidence for the scales; and to show how the scales relate to extant two-dimensional models of affect.

Five factors of affective well-being

Warr (1990a) presented measures of work-related affective well-being across two axes: anxiety–contentment and depression–enthusiasm. Subsequent studies have indicated: changes to the items comprising the scales; re-labelling of the axes; and additional items be included to measure other aspects of affective well-being (Sevastos et al., 1992; Warr, 1992; Daniels et al., 1997). This stream of research provides evidence for three distinct bi-polar factors: anxiety–comfort, depression–pleasure and tiredness–vigour. This research also suggests two other factors: one factor representing enthusiasm, optimism and motivation; and another factor representing anger. It is desirable to have bi-polar scales to eliminate response tendencies (Spector et al., 1997). Larsen and Diener (1992) suggest affects such as 'bored', 'dull' and 'sluggish' represent states of unactivated, unpleasant affect opposite to activated pleasant affects such as 'enthusiasm'. Anger is characterized by high dominance and potency (MacKinnon & Keating, 1989). The polar opposites of anger may

be affects representing low dominance and low potency such as 'placid'. In the rest of this article, the labels used for these five factors of affective well-being are anxiety–comfort, depression–pleasure, bored–enthusiastic, tiredness–vigour and angry–placid.

As affective well-being is the cumulative experience of affects (Diener & Larsen, 1993), assessments typically cover periods of one or two weeks (Warr, 1990a). Over such periods, continual experience of affects such as boredom or tiredness may become unpleasant, increasing correlations between these and other anhedonic aspects of affective well-being. Therefore, the factors are expected to correlate. A similar argument can be applied to affects such as enthusiasm, pleasure and comfort. This argument is supported by studies that show people give greater weight to hedonic valence to judge their affects (Feldman, 1995), and theoretical statements that assessment of affective well-being necessarily emphasizes the hedonic valence of repeated experience of affects (Warr, 1990a).

Four alternative structures were tested for the five hypothesized factors. To test these competing models, confirmatory factor analysis (CFA) was used, as it allows a priori specification of models. Competing models can be tested against each other through a series of statistics that examine the overall fit of each of the models. Table 1 shows the items used in this study, and the hypothesized loadings for the models. From Warr's measures of depression and anxiety (1990a) and other research (MacKay et al., 1978; MacKinnon & Keating, 1989; Larsen & Diener, 1992; Sevastos et al., 1992; Daniels et al., 1997), the following items may represent well the five factors: the five items hypothesized to represent anxiety–comfort in every model; all six items representing depression–pleasure; all six items representing bored–enthusiastic in every model; the four items representing tiredness–vigour in every model; and the five items representing angry–placid in every model. The hypothesized loadings of the items 'at ease' and 'calm' distinguish models 1 and 3 from models 2 and 4. Daniels et al. (1997) found the item 'calm' to load significantly on anxiety–comfort. However, 'at ease' may reflect better comfort than 'calm'. Also, 'calm' may represent better low potency and low dominance that characterize the placid pole of angry–placid. The hypothesized loadings of 'alert' and 'full of energy' differentiate models 1 and 2 from models 3 and 4. Warr (1990a, 1992) hypothesized that these items should load on tiredness–vigour. Daniels et al. (1997) indicated these items could produce a better fit when loading on bored–enthusiastic. This result may be an artefact of insufficient items representing the vigour pole, relative to the number representing high enthusiasm in the Daniels et al. study.

Table 1 shows that each item also loads on one of two response bias factors. Response bias may obscure the true nature of measures of affective

Table I Summary of hypothesized factor loadings for models tested in this study

Item	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Response bias**
Anxious	A–C	A–C	A–C	A–C	–
Worried	A–C	A–C	A–C	A–C	–
Tense	A–C	A–C	A–C	A–C	–
Relaxed	A–C	A–C	A–C	A–C	+
Comfortable	A–C	A–C	A–C	A–C	+
Calm	A–C	A–P	A–C	A–P	+
Depressed	D–P	D–P	D–P	D–P	–
Miserable	D–P	D–P	D–P	D–P	–
Gloomy	D–P	D–P	D–P	D–P	–
Happy	D–P	D–P	D–P	D–P	+
Pleased	D–P	D–P	D–P	D–P	+
Cheerful	D–P	D–P	D–P	D–P	+
Bored	B–E	B–E	B–E	B–E	–
Sluggish	B–E	B–E	B–E	B–E	–
Dull	B–E	B–E	B–E	B–E	–
Enthusiastic	B–E	B–E	B–E	B–E	+
Optimistic	B–E	B–E	B–E	B–E	+
Motivated	B–E	B–E	B–E	B–E	+
Tired	T–V	T–V	T–V	T–V	–
Fatigued	T–V	T–V	T–V	T–V	–
Sleepy	T–V	T–V	T–V	T–V	–
Active	T–V	T–V	T–V	T–V	+
Alert	T–V	T–V	B–E	B–E	+
Full of energy	T–V	T–V	B–E	B–E	+
Angry	A–P	A–P	A–P	A–P	–
Annoyed	A–P	A–P	A–P	A–P	–
Aggressive	A–P	A–P	A–P	A–P	–
Placid	A–P	A–P	A–P	A–P	+
Patient	A–P	A–P	A–P	A–P	+
At ease	A–P	A–C	A–P	A–C	+

Key: A–C = anxiety–comfort, D–P = depression–pleasure, B–E = bored–enthusiastic, T–V = tiredness–vigour, A–P = angry–placid, + = positive item response bias factor, – = negative item response bias factor.
* Hypothesized loadings on the response bias factors are the same for every model.

well-being (Gotlib & Meyer, 1986; Warr, 1990a). Daniels et al. (1997) found that controlling for response bias provided a significantly better fit over models without such control. Therefore, response bias was controlled in all models tested here, in the same manner used by Daniels et al. Two measurement factors were specified for negatively and positively worded items, as there may be differential thresholds for rating negatively and positively

worded items: people may not readily rate themselves as experiencing negatively worded states, although they may be more willing to rate themselves as *not* experiencing positively worded states (Gotlib & Meyer, 1986).

Relationship of five factors to models of affect

Watson and Tellegen (1985) proposed that affect can be represented in a two-dimensional circular space or circumplex by two orthogonal factors labelled negative affect and positive affect. High negative affect is represented by anxiety and hostility; low negative affect is represented by calmness and relaxation. High positive affect is represented by a state of pleasant arousal (e.g. enthusiasm) and low positive affect is represented by a state of unpleasantness and low arousal (e.g. dull, sluggish). Larsen and Diener (1992) contended that positive and negative affect emerge as dominant factors, because the choice of rotation is arbitrary in circumplex models (Guttman, 1954). If an alternative rotation is chosen, two other factors emerge from exploratory analyses. These are labelled pleasantness–unpleasantness and arousal (Russell, 1980). These are orthogonal to each other, yet oblique to negative affect and positive affect. Pleasantness refers to affects such as happiness; unpleasantness to affects such as depression. Arousal refers to high activation, wakefulness and alertness. The opposite of wakefulness refers to low activation, fatigue and sleepiness.

Two-dimensional models help to account for spatial relationships amongst affects. They do not indicate any qualitative differences amongst major categories of affect (Parkinson, 1995). The five factors outlined above should correspond to clusters of discrete affects arranged in two-dimensional space (Haslam, 1995). Figure 1 shows the hypothesized relationships between the five factors and the two-dimensional circumplex. Greater weight is given to hedonic tone to emphasize its importance, by expanding this axis to form an ellipse (Warr, 1990a). The factors are hypothesized to be bi-polar, consistent with representation in two-dimensional space. As negative affect comprises anger and anxiety, anxiety–comfort and angry–placid are closely aligned in the circumplex. These two factors are furthest from bored–enthusiastic and tiredness–vigour, which correspond more closely to positive affect and arousal respectively in the Watson and Tellegen, and Russell models. Bored–enthusiastic and tiredness–vigour are closely aligned because positive affect and arousal are adjacent in circumplex models. Depression–pleasure lies between anxiety–comfort and bored–enthusiastic. This reflects: Russell's pleasantness axis situated between negative affect and positive affect; the association between depression and low positive affect (Tellegen, 1985); and that depression can be characterized by low positive

affectivity and high negative affectivity, but anxiety can be characterized solely by high negative affectivity (see Watson et al., 1988a).

There are two implications of arranging the five affective well-being factors in the circumplex. First, a smaller number of primary factors may provide more parsimonious measurement. In this study, this possibility was tested by examining several alternative models consisting of two, three and four primary factors (explained in results section). Second, five primary factors may be related by two second order factors. This possibility was tested also.

Methods

The study comprised two samples. For both samples, anonymous self-completion questionnaires were mailed to respondents through the internal mail systems in participating organizations. Each questionnaire contained the 30 items hypothesized to represent the five aspects of affective well-being. The items were preceded by the question 'Thinking of the past week, how much of the time has your job made you feel each of the following?' (see Warr, 1990a). Each item was rated on a six-point fully anchored scale. The possible responses were 'never' (scored 1), 'occasionally (scored 2), 'some of the time' (scored 3), 'much of the time' (scored 4), 'most of the time' (scored 5) and 'all of the time' (scored 6). After finding the best factor structure for the items, the overall score for each scale was found by reverse scoring the negative adjectives, summing the responses and dividing by the number of items (see Warr, 1990a). High scores on each measure indicate good affective well-being.

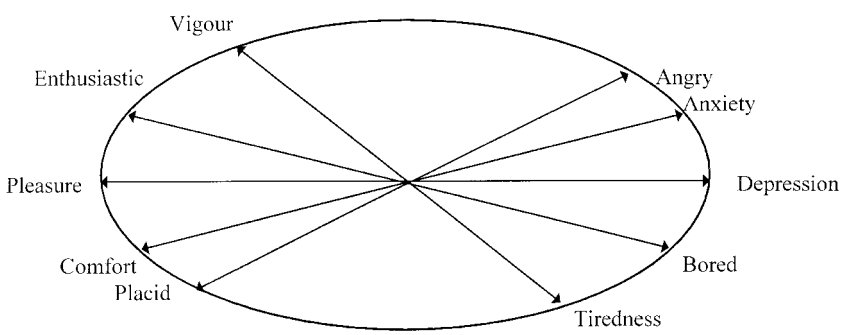

Figure 1 Five factor model of affective well-being in two-dimensional space

Sample 1: social services workers

The sampling frame was all 2340 workers from a UK social services department, except those on extended leave. Respondents were given postage paid envelopes to return to the author. The response rate was 37.2 percent (n = 871). Most of the respondents were female (79.7 percent). On average, the sample was 42.8 years old (SD = 10.1), had been working in the same job for 5.3 years (SD = 5.0) and had been working for the organization for 8.1 years (SD = 6.3). Many were care assistants (28.6 percent), service managers (17.6 percent) or social workers (17.1 percent).

The questionnaire contained measures of job characteristics, job competence, negative affectivity and positive affectivity. The job characteristics assessed were job autonomy, closeness of supervision, quantitative work load, role clarity, help support and esteem support. The items comprising these scales were assessed on seven-point scales (1 = 'strongly disagree', 7 = 'strongly agree'). Job autonomy was assessed with Haywood-Farmer and Stuart's (1990) four-item task independence scale (mean = 21.55, SD = 4.70, α = 0.77). Closeness of supervision was assessed by Haywood-Farmer and Stuart's four-item closeness of supervision scale (mean = 12.54, SD = 5.11, α = 0.69). Quantitative work load was measured by two items from Daniels and Guppy's (1995) measure (mean = 8.12, SD = 3.33, α = 0.54). Role clarity was measured by four items adapted from Caplan et al.'s measure of role ambiguity (1975) and an additional item (mean = 26.01, SD = 5.90, α = 0.77). Help support was measured by four items adapted from Caplan et al.'s measures of social support (1975), three items adapted from Daniels and Guppy's measure of help support (1995) and another item (mean = 38.78, SD= 9.83, α = 0.86). Esteem support was measured by two items adapted from Daniels and Guppy's (1995) measure (mean = 9.37, SD = 3.12, α = 0.78). Job competence was measured by Warr's (1990a) six-item measure, slightly adapted for this study (mean = 22.76, SD = 3.92, α = 0.64). Each item was rated on a five-point scale (1 = 'strongly disagree', 5 = 'strongly agree'). Negative affectivity and positive affectivity were measured by items adapted from Eysenck and Eysenck's (1968) measures of neuroticism and extraversion. Items were rated on a four-point fully anchored scale (1 = 'almost never', 2 = 'quite seldom', 3 = 'quite often', 4 = 'almost always'). Nine items were used to measure negative affectivity (mean = 15.92, SD = 4.12, α = 0.81). Eight items were used to measure positive affectivity (mean = 23.49, SD = 4.40, α = 0.85).

Sample 2: university workers

The sampling frame was 3300 employees of a UK university. Respondents returned questionnaires to the occupational health department of the

university. The response rate was 58.0 percent (n = 1915). The majority of respondents were female (67.0 percent). The modal value for age was 46–50 years (21.0 percent). The modal tenure with the university was over 10 years (39.4 percent). The modal tenure in current job was between one and three years (29.2 percent). Most respondents were secretarial/clerical staff (36.8 percent) or academic/research staff (23.7 percent).

The questionnaire contained measures of job characteristics and health. The job characteristics assessed were job control (mean = 4.89, SD = 1.18, α = 0.78), under/overload (mean = 5.46, SD = 1.14, α = 0.75), and social support at work (mean = 4.53, SD = 1.43, α = 0.78). These scales were designed for this study. The items comprising these scales were assessed on seven-point fully anchored scales (1 = 'strongly disagree', 7 = 'strongly agree'). Scale scores were derived by dividing the sum of all the items (after reverse scoring) by the number of items in the scale. Job control was measured by four items. Under/overload was measured by five items, assessing low job demands and high job demands. The social support measure consisted of four items that assessed support from line managers and other people at work. Health was measured by a slightly modified version of the UK version of the SF-36 (Jenkinson et al., 1996). The SF-36 assesses nine aspects of physical and mental health by self-report. The number of items and the response format of each scale differ, but the raw scores are recalibrated to give a score between 0 and 100. Higher scores represent better health. Except where noted, respondents were asked to rate their health over the previous four weeks. The SF-36 measures: physical functioning (nine items, mean = 80.42, SD = 15.48, α = 0.84); absence of physical limitations (four items, mean = 77.01, SD = 34.52, α = 0.85); absence of emotional limitations (three items, mean = 66.33, SD = 38.68, α = 0.77); social functioning (two items, mean = 72.36, SD = 25.34, α = 0.85); mental health (five items, mean = 64.48, SD = 19.09, α = 0.84); energy/vitality (four items, mean = 48.07, SD = 21.79, α = 0.87); absence of pain (two items, mean = 75.18, SD = 23.09, α = 0.85); perceived health (five items, rated 'in general', mean = 66.17, SD = 19.80, α = 0.79); and health improvement (one item assessing changes over the previous year, mean = 48.10, SD = 19.93).

Results

To test the relative fit of the alternative models representing the affective well-being items, CFA was conducted on the covariance matrices using the maximum likelihood algorithm of the EQS package (Bentler, 1993). To identify the models tested, the variance of each of the factors was fixed at 1.0. In every

model, all substantive factors were allowed to correlate, but the response bias factors were orthogonal to each other and the substantive factors. Using the multisample procedure in EQS, substantive factor covariances and substantive item loadings were constrained to be equal in both samples. Loadings on the response bias factors were allowed to vary between samples. Therefore, the multisample procedure was used to test for the best fitting model and the equivalence of substantive factor loadings and correlations in both samples.

EQS provides a number of statistics for evaluating models' goodness of fit. The minimum values of the χ^2 statistic, Akaike's information criterion (AIC) and Bozdogan's variant of Akaike's information criterion (CAIC) all indicate the best fit. Higher values of the normed fit index (NFI), non-normed fit index (NNFI) and comparative fit index (CFI) all indicate superior fit. Models are considered acceptable if these three statistics exceed 0.90 (Dunn et al., 1993). The values of these statistics for the four models are shown in Table 2. The best fit is obtained for model 2.[1] For this model, the NFI, NNFI and CFI are in the range considered acceptable. Table 2 also shows the fit statistics for a number of primary factor models, specifying alternative two, three or four factor solutions. These models were derived by assigning items to more inclusive primary factors, according to which factor they were assigned to in model 2. Table 2 explains the rationale underlying these models. None of the other primary factor models achieves the same degree of fit as model 2,[2] indicating a solution with five substantive factors and two response bias factors is the best explanation of the structure underlying the items. Finally, Table 2 also shows the results for a CFA with two second order factors specified. To identify the model, exploratory factor analysis with an orthogonal rotation was performed on the factor covariance matrix derived from model 2, using the procedure available in EQS. The second order factor loadings for the CFA were set to the rotated factor loadings derived from this analysis. The first order loadings were set to those derived from model 2. Factor variances were set to 1.0, excepting the five substantive first order factors, whose variance was determined by the second order factors. The second order and response bias factors were orthogonal to each other. Table 2 shows that the fit of the second order model is similar to that of the first order model, indicating two second order factors underlying the five primary factors, but orthogonal to the two response bias factors.

Table 3 shows the factor loadings, standard errors and significance of the substantive factor loadings for model 2. Each item loads upon its hypothesized factor in the expected direction at $p < .001$, supporting the hypothesized structure of the scales. Table 4 shows the second order factor loadings. The first factor is characterized by extremely high loadings of anxiety–comfort and angry–placid. This is similar to Watson and Tellegen's negative

Table 2. Goodness of fit statistics for the four models of affective well-being items, for both samples

Model	χ^2	*df*	*p* <	*AIC*	*CAIC*	*NFI*	*NNF*	*CFI*
1	5174.21	770	.001	3634.21	−1618.15	.90	.90	.91
2	4952.87	770	.001	3412.87	−1839.48	.90	.91	.92
3*	5327.80	770	.001	3787.80	−1464.55	.89	.90	.91
4*	5111.01	770	.001	3571.01	−1681.35	.90	.90	.91
*Other primary factor models***								
2 factors								
(a) (AC DP AP) (BE TV)	6524.15	779	.001	4966.15	−347.60	.87	.87	.88
(b) (AC AP DP) (DP AP TV)	5893.77	773	.001	4347.77	24.18	.88	.88	.90
(c) (AC AP) (DP BE TV)	6895.93	779	.001	5337.93	−925.05	.86	.86	.88
3 factors								
(d) (AC AP) (DP BE) (TV)	6505.42	777	.001	4951.42	−348.68	.87	.87	.88
(e) (AC AP) (DP) (BE TV)	5841.10	777	.001	4287.10	−1013.01	.88	.87	.90
(f) (AC DP) (AP) (BE TV)	5819.15	777	.001	4265.15	−1034.95	.89	.89	.90
4 factors								
(g) (AC AP) (DP) (BE) (TV)	5396.37	774	.001	3848.37	−1431.28	.89	.89	.90
(h) (AC DP) (AP) (BE) (TV)	5757.76	774	.001	4209.76	−1069.88	.89	.89	.90
(i) (AP) (AC) (DP BE) (TV)	5862.59	774	.001	4314.59	−965.05	.88	.89	.90
(j) (AC) (AP) (DP) (BE TV)	5595.59	774	.001	4047.58	−1232.06	.89	.89	.90
2nd order model	5021.20	800	.001	3421.20	−2035.80	.90	.91	.92

* In estimating these models, for one sample only, EQS automatically constrained some parameters. As the number of covariances and variances exceeds the number of estimated parameters and the constraints were made on only one sample, the constraints may result from empirical, rather than model, under-identification (Dunn et al., 1993). These results should be treated with caution. Nevertheless, the under-identified models are not the best fitting models.

** The other primary factor models assigned items to more inclusive primary factors, according to which factor they were assigned to in model 2. The same response bias factors were retained as models 1–4. Two primary factor models were based on:(a) the Russell (1980) model (pleasantness–unpleasantness = DP, AC, AP; arousal = BE, TV); (b) the Watson and Tellegen model (1985; Watson et al., 1988a) (negative affect = AC, AP; positive affect = BE, TV; DP is a combination of both factors, and therefore loads on both factors); (c) DP reflecting positive affect more strongly (see Tellegen, 1985). The other primary models were based on assigning items from adjacent factors in the five-dimensional model to more inclusive factors, for every possible combination of three or four factors.

affect (1985). The second factor is characterized by extremely high loadings of bored–enthusiastic and tiredness–vigour, similar to Watson and Tellegen's positive affect. Depression–pleasure loads on both factors, although not to the same degree as the principal markers. This result indicates depression–pleasure lies between the second order factors of negative and positive affect (see Watson et al., 1988a). The validity of the five new scales is supported by these results, showing that the five primary factors map on to the circumplex model of Watson and Tellegen.

Table 3 Item factor loadings, standard errors and significance levels

Item	*A–C*		*D–P*		*B–E*		*T–V*		*A–P*	
	FL	*SE*	*FL*	*SE*	*FL*	*SE*	*FL*	*SE*	*FL*	*SE*
Anxious	.83	.03								
Worried	.78	.04								
Tense	.77	.02								
At ease	–.66	.03								
Relaxed	–.57	.02								
Comfortable	–.54	.02								
Depressed			.80	.02						
Miserable			.76	.02						
Gloomy			.85	.02						
Happy			–.65	.02						
Pleased			–.50	.02						
Cheerful			–.59	.02						
Bored					.69	.02				
Sluggish					.59	.02				
Dull					.76	.02				
Enthusiastic					–.81	.02				
Optimistic					–.59	.02				
Motivated					–.82	.02				
Tired							–.35	.03		
Fatigued							–.23	.03		
Sleepy							–.48	.03		
Active							.77	.02		
Alert							.64	.02		
Full of energy							.62	.02		
Angry									.87	.02
Annoyed									.79	.02
Aggressive									.67	.02
Placid									–.35	.03
Patient									–.44	.03
Calm									–.50	.02

Key: FL= factor loading, SE= standard error.
All loadings, $p < .001$.
Loadings on response bias factors were not constrained to be equal in both samples. For clarity, these loadings are omitted. They are available from the author on request.

Table 4 also shows the means, standard deviations, α coefficients of reliability and correlations for the scales in both samples. This table shows that each scale has acceptable reliability. In both samples, the new scales are correlated (all $p < .001$). Since the new scales measure affective well-being,

Table 4 Second order factor loadings, means, standard deviations, correlations and α coefficients of reliability for scales

	2nd order factor loadings		*Social services*							*University*						
Scale	*Negative affect*	*Positive affect*	*Mean*	*SD*	*1*	*2*	*3*	*4*	*5*	*Mean*	*SD*	*1*	*2*	*3*	*4*	*5*
1 Anxiety–comfort	.88	.19	4.27	.92	.85					3.61	1.01	.88				
2 Depression–pleasure	.68	.65	4.62	.79	.76	.84				3.96	0.96	.77	.88			
3 Bored–enthusiastic	.30	.88	4.48	.79	.58	.78	.79			3.92	0.92	.52	.80	.84		
4 Tiredness–vigour*	.19	.88	4.24	.84	.67	.75	.69	.81		3.60	0.91	.63	.71	.73	.81	
5 Angry–placid	.84	.26	4.54	.80	.69	.69	.52	.59	.86	3.86	0.85	.75	.68	.46	.52	.79

*The direction of the loadings with tiredness–vigour has been made positive for clarity. EQS reversed automatically the polarity of this latent variable (see Table 3).
α coefficients are shown on primary diagonals, all *rs*, $p < .001$, two tailed.

rather than affect per se, these correlations reflect the greater weight given to the hedonic tone of repeated experience of these affects (Warr, 1990a).

Table 5 shows the partial correlations between each affective well-being scale and the other measures, after controlling for all other measures of affective well-being. It shows that each scale is related uniquely to at least one variable. These results not only support the validity of the new scales, but also indicate their unique explanatory power. Whilst many of the results are in expected directions, some warrant comment. In both samples, there are negative partial correlations between work load and anxiety–comfort and tiredness–vigour, but positive correlations with bored–enthusiastic. This may reflect the physical energy expended through high work load, the association between anxiety and overload found in previous research (Warr, 1990b) and that underload is related to boredom (Carayon, 1994). In the social services sample, negative affectivity has a significant partial correlation with anxiety–comfort only. This may reflect the strong component of trait anxiety in this measure of negative affectivity. Positive affectivity has a significant partial correlation with depression–pleasure, reflecting the component of low positive affectivity in depression (Watson et al., 1988a). Positive affectivity's partial correlations with bored–enthusiastic and tiredness–vigour are not significant. This may indicate considerable shared variance amongst positive affectivity, bored–enthusiastic, tiredness–vigour and depression–pleasure. Alternatively, it may reflect work-related boredom, enthusiasm and tiredness are best predicted by environmental or state variables, rather than trait person variables. Bored–enthusiastic's and tiredness–vigour's significant partial correlations with other variables support this view. In the social services sample, tiredness–vigour's partial correlation with help support is negative. This may indicate exerting eliciting support at work can consume physical energy. Angry–placid's partial correlation with the SF-36 energy/vitality measure in the university sample is negative, although other significant partial correlations with energy/vitality are positive. Anger is characterized by dominance (MacKinnon & Keating, 1989). Therefore, to experience anger, a certain amount of energy is required.

Discussion

The results of the first order CFAs indicate that five primary substantive factors and two response bias factors account best for the items' structure. The results of the partial correlation analyses indicate each of the substantive factors has unique explanatory power, again supporting a five substantive factor model. The second order CFA indicates these five factors conform

Table 5 Partial correlations, controlling for other affective well-being variables

Measure	*A–C*	*D–P*	*B–E*	*T–V*	*A–P*
Social services					
Job autonomy	.12	.01	.16*	–.10	–.03
Close supervision	–.11	.08	–.11	.01	.05
Work load	–.20*	.02	.23*	–.20*	.12
Role clarity	.14*	–.03	.15*	–.07	–.10
Help support	.13*	.12	.13	–.14*	–.06
Esteem support	.03	.07	.21*	–.08	–.05
Job competence	.27*	.03	–.06	.11	.02
Negative affectivity	–.15*	–.07	–.10	–.10	–.04
Positive affectivity	.04	.20*	–.06	.09	–.10
University					
Physical functioning	.02	–.06	.04	.11*	.05
Physical limitations	.09	.00	–.05	.20*	.00
Emotional limitations	.10*	.15*	–.05	.11*	.02
Social functioning	.16*	.11*	–.04	.19*	–.05
Mental health	.23*	.27*	–.02	.07	–.02
Energy/vitality	.16*	.07	–.02	.50*	–.10*
Absence of pain	.13*	–.08	.08	.14*	–.03
Perceived health	.14*	–.03	.06	.21*	–.02
Health improvement	.09*	.08	–.06	.10*	–.04
Under–overload	–.18*	–.07	.41*	–.13*	–.02
Job autonomy	.04	–.04	.23*	–.01	.02
Social support	.07	.05	.09*	–.01	.03

*p < .001

Key: A–C = anxiety–comfort, D–P = depression–pleasure, B–E = bored–enthusiastic, T–V = tiredness–vigour, A–P = angry–placid.

Because of large sample sizes and the large number of partial correlations, α levels were set at $p < .001$ to minimize the risk of type I error.

For social services, $n = 722$, for university, $n = 1436$ (due to missing data).

Zero order correlation matrices are available from the author on request.

to the dominant circumplex model of affect (Watson & Tellegen, 1985). Together, the analyses support the validity of the new scales. The reliability of the scales is also acceptable. The significance of the results relates to theoretical issues of the relationships between different aspects of work-related affective well-being, the emergence of superordinate factors and the best means of measuring work-related affective well-being.

Support for five first order substantive factors indicates the major aspects of affective well-being form clusters around the circumplex (Haslam,

1995). The pattern of these clusters is such that five bi-polar factors represent the relationships between these clusters. The partial correlation analyses show that even factors close to each other in the circumplex have a different pattern of associations with theoretically related variables.

The results indicate a hierarchical structure for work-related affective well-being. The five first order substantive factors are connected at the next level of abstraction by two superordinate factors – negative and positive affect. The emergence of both superordinate factors is consistent with Watson and Tellegen's circumplex model (1985). However, Larsen and Diener (1992) differentiate arousal from positive affect, with arousal having no hedonic tone (Russell, 1980), but positive affect being a state of hedonic activation (Watson & Tellegen, 1985). The scales used in this study assess affective well-being as a self-reported assessment of affect over the previous week (Warr, 1990a). During this time, the repeated experience of fatigue and tiredness may become anhedonic, increasing the correlation between bored–enthusiastic and tiredness–vigour. The loadings of second order factor analyses may not be interpreted as easily where affect is assessed over more recent periods (e.g. hourly, daily).

A cognitive explanation of the findings is that the superordinate factors may represent general orientations towards goals (Carver & Scheier, 1990): progress characterized by positive affect, impediments by negative affect. Specific factors may emerge through more specific characteristics of goal orientation (Oatley & Johnson-Laird, 1987): for example, anger results from frustration of current goals and anxiety from threat to current goals. Another explanation differentiates between a general cognitive system for the superordinate factors, but that specific aspects of affective well-being reside in the communicative functions of affect (Parkinson, 1996).

Measures of five primary factors are best used to explore qualitative differences amongst the components of affective well-being, or where there are reasons for suspecting divergence in the causal processes underlying work-related affective well-being. There are circumstances in which it may be appropriate to use measures of two superordinate factors, for example: where short measures are needed, such as in diary studies; where there are substantive reasons for concentrating upon the major dimensions of affective well-being, such as where there are clear hypotheses concerning positive affect or negative affect; or where controls are needed for major dimensions of affective well-being in statistical analyses.

The results here highlight some problems with two of the most popular measures of positive and negative affect: PANAS (Watson et al., 1988b) and JAS (Brief et al., 1988). First, neither contains a balance of items in terms of item valences. The presence of response bias factors indicates measures

should contain a balance between items of opposite valences (see Warr, 1990a; Daniels et al., 1997; Spector et al., 1997). Second, both negative affect scales contain more items assessing anxiety than anger. The second order CFA here indicates measures of negative affect should assess anxiety and anger in equal measure. Failure to do so could mean one of the primary factors is given more weight in assessment, leading to artefactual conclusions on the basis of specific causal processes for that primary factor. With the PANAS and JAS, this may mean conclusions correspond more closely to the primary factor of anxiety than the higher order factor of negative affect. For example, in this study, a measure of negative affectivity with a strong component of trait anxiety has a significant partial correlation only with anxiety–comfort. It is unclear whether a measure of negative affectivity with equal components of trait anger and trait anxiety would have a significant partial correlation with angry–placid too. Whether measures of positive affect should assess bored–enthusiastic and tiredness–vigour in equal measure may depend on the period over which affect is to be assessed, as noted above. However, the second order CFA suggests assessments of positive affect over the preceding week should assess both bored–enthusiastic and tiredness–vigour.

The results are consistent with studies that suggest a comprehensive and detailed assessment of affective well-being may require measures that go beyond two primary dimensions (Burke et al., 1989). Where there is substantive justification, an approach to measuring affective well-being such as that presented here may help to capture better the relationships between work-related affective well-being and other organizational phenomena.

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Notes

1 Model 2 was compared to two less constrained versions of itself: one where substantive covariances were allowed to vary between samples, but with substantive factor loadings constrained; and one where both loadings and covariances were allowed to vary between samples.

Nested χ^2 comparisons between successively less constrained models were significant. However, these comparisons are sensitive to the large sample sizes, and therefore do not necessarily indicate that the two less constrained models display better fit (Brannick, 1995; Kelloway, 1995). The NFI is slightly higher for the least constrained model (.91), although this too is sensitive to sample size (Bentler, 1993). The NNFI and CFI are less sensitive to sample size, and are equivalent for all three versions of model 2. There is improvement in the AIC for the models with fewer constraints, but the CAIC shows the best fit for the model with substantive covariances and factor loadings constrained for both samples. Both AIC and CAIC are based on the χ^2 statistic, but only the CAIC makes an adjustment for sample size (Bentler, 1993: 92). Given the known sensitivity of the χ^2 statistic and the NFI to sample size – the balance of evidence indicates that differences between substantive factor loadings and covariances are due to chance. Full details of these analyses are available from the author on request.

2 An alternative method for judging the adequacy of five primary factors over a smaller number is to specify a series of models where one of the possible correlations between substantive factors is fixed at one. Using the same specifications for model 2 in Table 2, 10 models were specified in which one of the 10 possible correlations amongst substantive factors was fixed at one. Many of these alternative models had identification problems. Of the 60 indices of fit used in these 10 models (χ^2, NFI, NNFI, CFI, AIC, CAIC), 59 indicated model 2 has better fit. One value of the NFI was equivalent to the value for model 2 (.90). This was the model in which the correlation between bored–enthusiastic and tiredness–vigour was fixed at one. However, this model had identification problems, and all other fit indices were superior for model 2. Therefore, these results also support the use of five primary factors. Full details of these analyses are available from the author on request.

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