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Gregory J. Boyle, *Bond University*

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Gregory J. Boyle

University of Melbourne

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Abstract

The DES-IV (a 49-item version of the Differential Emotions Scale) was administered to 212 undergraduate college students on two separate measurement occasions. The resulting subscale scores were intercorrelated and subjected to an iterative principal factoring procedure together with rotation to direct Oblimin simple structure, for each measurement occasion separately. Three emotional mood-type factors accounted for much of the variance in the DES-IV subscales, suggesting the feasibility of scoring the instrument for typological factors. Comparisons with previous higher-order factorings of the instrument are made and results are discussed in terms of obtained coefficients of concordance across measurement occasions.

Introduction

Recent research has stressed the importance of the interrelationships between various emotional/mood states (e.g., Schwartz, 1982; Schwartz & Weinberger, 1980: Sirota & Schwartz, 1982). One multidimensional instrument used simultaneously to index several fundamental human emotions is the Differential Emotions Scale (Izard, Dougherty, Bloxom & Kotsch, 1974). The most recent version of this mood-state inventory, the DES-IV, is comprised of 49 items purported to measure 12 basic emotions (namely, Interest, Joy, Surprise, Sadness, Anger, Disgust, Contempt, Hostility, Fear, Shame, Shyness, and Guilt). According to Izard (1980, 1982: Izard & Buechler, 1980) the instrument taps the subjective-experience components of the 12 fundamental emotions which are discernible in the facial expression (cf. Schwartz, 1982).

Nevertheless, in many applied contexts, the measurement of 12 separate mood states may be unnecessary and overly time consuming. One way of avoiding this problem is to score the instrument for second-order typological mood-state factors. Boyle (1986c) reported a higher-order analysis of the DES-III (a 30-item version of the instrument) using a single-occasion R-factoring procedure with rotation to oblique simple structure. The first factor accounted for 48.2% of the variance measured in the primary factors and involved the subscales of Guilt, Sadness, Shame/Shyness, Fear and Disgust. Factor II (accounting for 32.1% of the variance) involved the subscales of Joy, Interest and Surprise. Factor III (accounting for 12.1% of the variance) had high loadings for Contempt and Anger, while Factor IV (7.6% of the variance) clearly represented depressed mood, providing further evidence of the structural complexity of this typological construct.

In a subsequent study, Boyle (1986a) investigated the higher-order factor structure of the DES-IV and Eight State Questionnaire (8SQ) instruments combined. Using an iterative principal factoring procedure together with rotation to oblique simple structure, Boyle reported evidence for three distinct secondary DES-IV factors, pertaining to the Eysenckian dimensions of Extraversion, and Neuroticism respectively (cf. Eysenck, 1983), as well as to a hostility dimension involving the primary DES-IV subscales of Anger, Disgust, and Contempt. The findings of this analysis therefore suggested that the DES-IV, when administered under essentially non-emotive conditions, comprises relatively few typological mood-state dimensions. However, both these studies relied on single occasion measures and did not investigate change dimensions, per se. The difficulty with single-occasion R-factoring is that it provides only a static 'photograph' of the emotions/moods at a certain moment in time. In contrast, the dR-methodology employed in a separate study by Boyle (1987) has been accepted as a valid method for elucidating change dimensions - e.g., Cattell, 1978, 1979, 1982; Lam, 1981; Nesselroade & Cable, 1974). However, in Boyle's (1987) study, only two separate DES-IV secondary factors emerged clearly from the analysis of change scores. The first represented state Neuroticism, while the second involved a combination of Extra version and Hostility. Seemingly, the three dimensions already found by Boyle (1986a) had been condensed into two dR-factors. The reliability of the DES-IV had been examined favorably in several studies (e.g., Boyle, 1984, 1985b; Izard& Blumberg, 1985, 1986; Izard, Blumberg & Oyster, 1985; Kotsch, Gerbing & Schwartz, 1982). As for construct validity, several studies had essentially supported the primary factor structure of the instrument (e.g., Emde, 1980; Fuenzalida, Emde, Pannabecker & Stenberg, 1981; Mosher & White, 1981; Boyle,

1984). Accordingly, and given that reliability estimates had been found to range from .48 to .98 for immediate retest (dependabilities), with the average estimate being .76 over alll2 DES-IV subscales (Boyle, 1986b), it seemed appropriate to investigate further the higher-order factor structure of the DES-IV by examining the concordance of factor patterns across two separate measurement occasions. The work of Izard et al. (1985) and Schwartz (1982) has clearly illustrated the importance of patterns of fundamental emotions in human behavior. This area has received comparative neglect over recent years due to the excessive interest in cognitive interpretations in isolation from interacting emotional states. In contrast, neuropsychological evidence (e.g., Powell, 1979) has demonstrated the existence of affective-cognitive connections in the brain. In this context, the multivariate measurement of fundamental emotions seems all the more important, especially at the typological mood-state level which has so far received relatively little attention in the psychometric literature. Investigation of a few major mood-type dimensions rather than a multitude of primary states, clearly has important benefits in terms of measurement efficiency for clinical psycho- logical assessment. The present paper addresses this problem of elucidating the central typological mood-state dimensions, by delineating the secondary structures measured in the DES-IV instrument.

Method

Subjects and Procedure

The sample comprised 212 undergraduate college students attending either the Institute of Catholic Education, Melbourne, or the Melbourne College of Advanced Education. The mean age of the sample was approximately 21 years

(ranging from 18 to 49 years). Almost all students (about 90%) were females and Australian by birth. Virtually all students came from a predominantly middle-class socio- economic background and all had passed Year 12 English prior to commencing their college studies. The DES-IV instrument was administered during normal class periods in order to facilitate the co-operation and continued motivation of the students. The two separate measurement occasions were at least one week apart in time.

Analysis and Results

The intercorrelations of the DES-IV subscale scores (a 12 x 12 matrix served as the starting point for the factor analysis on each measurement occasion) were factor analysed using an iterative principal factoring procedure (requiring 21 iterations for the first occasion and 26 iterations for the second occasion) to reach convergence of the initial communality estimates (SMC's) at the fifth decimal place. Iteration, which is an important consideration when factoring small matrices (cf. Gorsuch, 1983) was followed by rotation to oblique (direct Oblimin) simple structure using the SPSS statistical package (Nie, Hull, Jenkins, Steinbrenner & Brent, 1975). On the basis of the Scree test (Cattell & Vogelmann, 1977; Barrett & Kline, 1982; Hakstian, Rogers & Cattell, 1982; Gorsuch, 1983) three factors were extracted and rotated. Table 1 presents the means and standard deviations for the DES-IV subscale scores on each occasion of measurement, while Table 2 includes the intercorrelations for the DES-IV subscales on each occasion. Direct comparison of the 12 subscale means and standard deviations are possible as the scores have been computed on a common measurement scale. The oblique factor pattern solutions across both occasions are presented in Table 3. Clearly, the same

three higher-order DES-IV factors emerged on each separate occasion, despite the fact that transitory states rather than stable traits were being measured.

Table 1

Means and Standard Deviations for DES-IV Subscale Scores (N=212)

	Occasion 1		**Occasion 2**	
Subscale	M	S.D.	M	S.D.
Interest	8.83	2.71	8.19	2.76
Joy	10.05	2.87	10.26	3.02
Surprise	6.62	2.75	6.16	2.65
Sadness	6.83	3.14	6.00	3.04
Anger	6.84	3.45	6.27	3.36
Disgust	5.44	2.64	5.09	2.75
Contempt	5.92	2.37	5.58	2.53
Hostility (inner-directed)	5.74	2.69	5.16	2.45
Fear	5.70	2.99	4.70	2.26
Shame	6.09	2.24	5.43	2.11
Shyness	5.72	2.64	5.03	2.28
Guilt	5.82	2.61	5.26	2.49

TABLE 2

Intercorrelations for DES-IV Subscale Scores (N = 212)

Subscale	Interest	Joy	Surprise	Sadness	Anger	Disgust	Contempt	Hostility	Fear	Shame	Shyness	Guilt
Interest												
Joy	.58(.56)											
Surprise	.37(.36)	.15(.12)										
Sadness	-.06(-.21)	-.44(-.57)	.27(.27)									
Anger	.04(-.14)	-.24(-.46)	.22(.34)	.59(.73)								
Disgust	-.02(-.11)	-.31(-.36)	.34(.40)	.65(.69)	.57(.74)							
Contempt	.21(.03)	-.04(-.20)	.31(.44)	.44(.55)	.52(.63)	.49(.69)						
Hostility	-.02(-.23)	-.30(-.43)	.28(.23)	.74(.73)	.50(.62)	.52(.63)	.40(.50)					
Fear	-.01(-.11)	-.34(-.42)	.30(.37)	.71(.71)	.55(.71)	.61(.74)	.39(.53)	.56(61)				
Shame	.04(-.07)	-.23(-.31)	.29(.32)	.70(.71)	.55(.66)	.57(.69)	.42(.55)	.69(.73)	.64(.73)			
Shyness	.08(-.05)	-.17(-.27)	.34(.38)	.64(.68)	.45(.65)	.56(.67)	.46(.53)	.66(.68)	.60(.68)	.74(.74)		
Guilt	.06(-.06)	-.22(-.31)	.38(.33)	.59(.59)	.57(.54)	.56(.57)	.45(.47)	.55(.61)	.58(.53)	.57(.56)	.58(.61)	

Notes: Correlations are shown to two decimal places. Correlations for the second measurement occasion are shown in parentheses. Correlations exceeding .14 are significant at the 5% level, while those exceeding .18 are significant at the 1% level.

Table 3
Oblique Factor Pattern Solution for DES-IV
Typological Mood States (N = 212)

Subscale	Factor 1	Factor 2	Factor 3	h^2
Interest	.00 (-.04)	*.77 (.73)*	. 11 (-.11)	.62 (.55)
Joy	-.08 (.00)	*.78 (.78)*	-.23 (.29)	.70 (.70)
Surprise	.17 (.04)	*.38 (.42)*	.28 (-.54)	.33 (.49)
Sadness	*.58 (.49)*	-.20 (-.27)	*.31 (-.34)*	.77 (.77)
Anger	-.01 (.13)	-.08 (-.22)	*.76 (-.71)*	.57 (.75)
Disgust	.12 (.21)	-.11 (-.11)	*.68 (-.69)*	.62 (.77)
Contempt	-.02 (.08)	.16 (.04)	*.66 (-.69)*	.45 (.57)
Hostility (inner-directed)	*.79 (.92)*	-.07 (-.10)	.01 (.11)	.65 (.75)
Fear	*.43* (.25)	-.13 (-.15)	*.38 (-.57)*	.61 (.67)
Shame	*.87 (.86)*	.02 (.07)	-.02 (-.02)	.74 (.74)
Shyness	*.88 (.80)*	.10 (.11)	-.05 (-.09)	.71 (.73)
Guilt	.28 *(.58)*	.01 (.02)	*.50* (-.15)	.56 (.49)
% Variance	48.7 (54.5)	15.5 (15.0)	6.4 (5.6)	
Eigenvalue	5.84 6.54)	1.86 (1.80)	.77 (0.67)	

Notes: Factor loadings are shown to two decimal places. Significant ($\geq$ .30) loadings are italicized. Factor loadings for the second mearsurment occasion are shown in parentheses. For the Occasion 1 solution, FI correlates -0.05 with F2, 0.79 with F3, while F2 correlates 0.03 with F3. For the Occasion 2 solution, FI correlates -0.26 with F2, -0.78 with F3, while F2 correlates 0.03 with F3.

Occasion 1 Results

Evidently, Factor 1 accounted for 48.7% of the variance and exhibited significant (>-30) loadings on the subscales labelled Sadness, Hostility (inner-directed), Fear, Shame and Shyness. This factor appears to represent the Eysenckian (e.g., Eysenck, 1983) Neuroticism dimension, albeit at the state level. Likewise, this factor seems to relate to Cattell's second-order trait dimension which he labelled Anxiety. Barton and Flocchini (1985) have shown that the Cattellian Anxiety dimension has an associated emotional state component. In the present instance, Factor 1 might best be labelled State Neuroticism.

Factor 2 (which accounted for 15.5% of the variance associated with the principal components) has significant loadings on all three of the positive mood- state subscales in the DES-IV (namely, Interest, Joy, Surprise) and no significant loadings on any of the negative mood-state subscales. This factor seems to represent the Eysenkian Extraversion dimension at the state level, *par excellence*.

Correspondingly, it represents the Cattellian Exvia dimension, which Barton and Flocchini (1985) have also demonstrated has an associated state component. This factor might be described as State Extraversion. Factor 3 (accounting for 64%) of the unrotated principal components' variance exhibited significant loadings for the DES-IV subscales Sadness of Anger, Disgust, Contempt Fear and Guilt. This factor appears to represent State Hostility, which has emerged as a typological mood-state entity from previous studies (e.g., Boyle, 1986a). This factor has nothing to do with the DES-IV subscale labelled Hostility, which is inner-directed rather than outer-directed.

Occasion 2 Results

On the second measurement occasion, Factor 1 accounted for 54.5%, of the variance associated with the unrotated principal components. In this instance, significant loadings were exhibited on the DES-IV subscales of Sadness, Hostility (inner-directed), Fear, Shame, Shyness and Guilt. Clearly this secondary DES-IV factor was essentially identical .with that obtained on the first measurement occasion and represents State Neuroticism. However, on the first occasion, the subscale labelled Guilt loaded significantly in relation to Factor 3 (State Hostility), whereas on the second occasion it more appropriately lined-up with Factor 1. In terms of concordance, the correlation coefficient (Pearson Product- Moment) obtained across occasions for Factor 1 was 0.92 (wherein the absolute values for each factor loading were correlated over all12 subscales across both measurement occasions). This high degree of concordance suggests that little fluctuation occurred in State Neuroticism over the two occasions. Hence it might be argued that while emotional states such as those measured in the DES-IV may be situationally sensitive to mood-state fluctuations, at the typological level, most of the state variance has been attenuated, and what remains is largely trait contamination variance (cf. Cattell, 1982).

As for Factor 2, on the second occasion it accounted for 15.0% of the variance, and again clearly was marked only by the positive mood-states indexed in the DES-IV instrument. For this dimension (State Extraversion), the level of concordance across measurement occasions was even higher than that for the first higher-order mood-type factor, and was 0.97. Once again, such a high level of concordance suggests the 'trait-like' characteristics of this factor.

In regard to Factor 3 (accounting for 5.6% of the variance), the pattern off actor loadings was similar to that obtained on the first occasion, with significant loadings on Sadness, Anger, Disgust, Contempt and Fear. However, in this instance, there was also a significant loading on Surprise even though it loaded on Factor 2 as well. Nevertheless, the similarity between Factor 3 on Occasions 1 and 2 was so strong that both factors clearly represented State Hostility. Again the level of concordance was high (0.85) suggesting the stability rather than the situational sensitivity of this typological dimension.

In conclusion, the present findings regarding typological mood-state dimensions measured in the DES-IV suggest that the instrument is fairly limited in terms of the number of higher-order factors indexed. This finding is consistent with previous research (e.g., Boyle, 1987). At the very least, however, the present findings do suggest that it should be possible to score the DES-IV for the three typological dimensions rather than for all 12 primaries, resulting in ease of interpretation for clinical psychologists and psychiatrists. However, while it appears feasible to score the instrument for typological mood states, this in no way diminishes the usefulness of scoring the primary subscales, but definitely adds to the flexibility of the instrument along the lines already established in Cattellian psychometrics. More fundamentally though, it does seem likely that the measurement of mood states at the typological level may have more characteristics of traits rather than of states, given the rather high levels of concordance across measurement occasions obtained above. If so, then the quest for central states may inevitably turn out to be an achievement not attainable, although the present findings provide only tentative evidence along these lines.

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