Pergamon

S0005-7967(96)00068-X

Behav. Res. Ther. Vol. 35, No. 1, pp. 79–89, 1997

0005-7967/97 $17.00 + 0.00

PSYCHOMETRIC PROPERTIES OF THE DEPRESSION ANXIETY STRESS SCALES (DASS) IN CLINICAL SAMPLES*

TIMOTHY A. BROWN,[1]† BRUCE F. CHORPITA,[1]
WILLIAM KOROTITSCH[2] and DAVID H. BARLOW[1]

[1]Center for Anxiety and Related Disorders, Boston University, 648 Beacon Street, Boston, MA 02215, U.S.A. and [2]University of North Carolina at Greensboro, Greensboro, NC, U.S.A.

(Received 9 April 1996; revised 17 July 1996)

Summary—The psychometric properties of the Depression Anxiety Stress Scales (DASS) were evaluated in two studies using large clinical samples (N = 437 and N = 241). In Study 1, the three scales comprising the DASS were shown to have excellent internal consistency and temporal stability. An exploratory factor analysis (principal components extraction with varimax rotation) yielded a solution that was highly consistent with the factor structure previously found in nonclinical samples. Between-groups comparisons indicated that the DASS distinguished various anxiety and mood disorder groups in the predicted direction. In Study 2, the conceptual and empirical latent structure of the DASS was upheld by findings from confirmatory factor analysis. Correlations between the DASS and other questionnaire and clinical rating measures of anxiety, depression, and negative affect demonstrated the convergent and discriminant validity of the scales. In addition to supporting the psychometric properties of the DASS in clinical anxiety and mood disorders samples, the results are discussed in the context of current conceptualizations of the distinctive and overlapping features of anxiety and depression. Copyright © 1997 Elsevier Science Ltd

INTRODUCTION

Anxiety and depression have been typically regarded by researchers to be distinct at the conceptual level. Nevertheless, attempts to quantify these constructs using questionnaires and clinical ratings have often demonstrated a high degree of overlap (intercorrelation) between measures of anxiety and depression (cf. Clark & Watson, 1991a). Such findings have led investigators to question whether clinical anxiety and depression are indeed empirically distinct phenomena and to explore the possibility that the considerable overlap evidenced by these measures reflects poor discriminant validity of these domains (e.g. anxiety and depression as different points on the same continuum or variations in the expression of a broader underlying disorder; Barlow, 1991; Barlow, Chorpita & Turkovsky, 1996). At the syndrome level, the high rates of comorbidity among the anxiety and mood disorders have also added to the debate on the distinguishability of these constructs (Andrews, 1996; Brown, 1996; Brown & Barlow, 1992).

Based on their review of this extensive literature, Clark and Watson (1991b) concluded that although anxiety and depression share a significant nonspecific component encompassing general affective distress and other common symptoms, the two constructs can be distinguished by certain unique features. Specifically, Clark and Watson have proposed a tripartite structure of anxiety and depression consisting of general distress or negative affect (shared by anxiety and depression), physiological hyperarousal (specific to anxiety), and an absence of positive affect (specific to depression). In a separate research program spanning from 1979 to 1990, S.H. Lovibond and P.F. Lovibond (Lovibond & Lovibond, 1993; Lovibond, 1983) conducted psychometric evaluations of a questionnaire that they developed to assess the full range of core symp-

*Portions of this paper were presented at the meeting of the Association for Advancement of Behavior Therapy, San Diego, CA, November 1994.

†Author for correspondence.

toms of anxiety and depression while providing maximum discrimination between the scales of anxiety and depression. Although the authors intended to develop a measure consisting of two scales (i.e. anxiety and depression), a third factor emerged from their analyses of scale structure consisting of items relating to difficulty relaxing, irritability, and agitation. Accordingly, the resulting three scales (consisting of 14 items each) were named the Depression Anxiety Stress Scales (DASS). Psychometric analyses of the DASS, conducted primarily with nonclinical samples, have provided strong support for the internal consistency and convergent and discriminant validity of the three scales (Lovibond & Lovibond, 1995). Exploratory and confirmatory factor analyses of the DASS items have consistently reproduced the three-factor structure in large nonclinical samples (Lovibond & Lovibond, 1995). Although the DASS was developed prior to Clark and Watson's model of anxiety and depression, the three psychometrically distinct DASS factors could be viewed as consistent with the three components of the tripartite model: DASS-Depression: characterized by low positive affect, loss of self-esteem and incentive, and a sense of hopelessness (absence of positive affect); DASS-Anxiety: characterized by autonomic arousal and fearfulness (physiological hyperarousal); and DASS-Stress: characterized by persistent tension, irritability, and a low threshold for becoming upset or frustrated (negative affect). In addition to this possible parallel with the tripartite model, we have observed that the DASS-Stress scale appears to evaluate symptoms corresponding to those associated with generalized anxiety disorder (GAD; e.g. irritability, muscle tension, feeling keyed up/on edge). Findings suggesting that these symptoms which distinguish GAD from other anxiety disorders contributed strongly to the decision to reformulate the associated symptom criterion of GAD in DSM-IV (Brown, Barlow & Liebowitz, 1994; Brown, Marten & Barlow, 1995; Marten, Brown, Barlow, Borkovec, Shear & Lydiard, 1993).

Although the existing data provide strong support for the psychometric and conceptual basis of the DASS, most of this research has been conducted using nonpatient samples (Lovibond & Lovibond, 1995). Hence, the purpose of the present studies was to examine the psychometric properties of the DASS in large clinical samples. The first study examined the reliability (internal consistency, temporal stability), factor structure, and the discriminability of the DASS in a large clinical sample (N = 437). In a second study using an independent clinical sample (N = 241), the psychometric properties of the scales were further evaluated with confirmatory factor analysis of the DASS latent structure and correlational analyses of convergent and discriminant validity.

STUDY 1

Method

Participants. Participants were 437 patients presenting for assessment and treatment at the Phobia and Anxiety Disorders Clinic, Center for Stress and Anxiety Disorders. Women constituted the larger portion of the sample (63.6%); the average age of the sample was 36.10 yr (SD = 10.55, range = 18–65). Diagnoses were established with the Anxiety Disorders Interview Schedule-Revised (ADIS-R; Di Nardo & Barlow, 1988), a structured interview designed to comprehensively evaluate the DSM-III-R (American Psychiatric Association, 1987) anxiety and mood disorders as well as screen for the presence of other major disorders (e.g. somatoform, psychotic). Conservative estimates of interrater agreement using the ADIS-R for principal DSM-III-R disorders (i.e. calculated on the basis of two independent interviews) range from moderate to excellent (Di Nardo, Moras, Barlow, Rapee & Brown, 1993). In instances where the patient was deemed as meeting criteria for two or more diagnoses, the 'principal' diagnosis was the one that received the highest ADIS-R clinical severity rating (0–8 scale) that indicated the diagnostician's judgment of the degree of distress and interference in functioning associated with the diagnosis. Patients' DSM-III-R principal diagnoses were as follows: panic disorder with or without agoraphobia (n = 150); GAD (n = 64); social phobia (n = 59); simple phobia (n = 20); obsessive–compulsive disorder (OCD) (n = 20); mood disorder (collapsing across major depressive disorder and dysthymic disorder; n = 35); other (e.g. posttraumatic stress disorder, anxiety or depressive disorder NOS, coprincipal diagnoses; n = 89).

Table 1. Reliability of the DASS: internal consistency (Cronbach's alpha)

	DASS-Depression	DASS-Anxiety	DASS-Stress
Entire sample (N = 437)	0.96	0.89	0.93
PD/A (n = 150)	0.96	0.89	0.93
GAD (n = 64)	0.95	0.89	0.94
SOC (n = 59)	0.95	0.89	0.94
SIM (n = 20)	0.91	0.88	0.94
OCD (n = 20)	0.96	0.88	0.88
MOOD (n = 35)	0.94	0.88	0.89

Note: PD/A = panic disorder with or without agoraphobia; GAD = generalized anxiety disorder; SOC = social phobia; SIM = simple phobia; OCD = obsessive–compulsive disorder; MOOD = mood disorder (major depression, dysthymia).

Measures. As noted earlier, the DASS is a 42-item instrument measuring current ("over the past week") symptoms of depression, anxiety, and stress. Each of the three scales consists of 14 items which are responded to using a 0–3 scale, where 0 = did not apply to me at all, and 3 = applied to me very much, or most of the time (range of possible scores for each scale is 0–42). Further details on the directions, items, and scoring of the DASS are presented in Lovibond and Lovibond (1995).*

Procedure. Following the ADIS-R, patients completed a questionnaire battery that included the DASS. In order to evaluate the test–retest reliability of the DASS, 20 patients were randomly selected to be re-administered the DASS 2 weeks following their intake evaluation (see *Results* for the diagnostic breakdown of the temporal stability sample).

Results

Reliability. The internal consistency of the DASS was calculated for the entire sample (N = 437) and for each principal diagnosis group. As seen in Table 1, the internal consistency (i.e. Cronbach's alpha) of each scale of the DASS was quite favorable, both for the entire sample (α = 0.96, 0.89 and 0.93 for Depression, Anxiety, and Stress, respectively) and within each diagnostic group (range of αs = 0.88–0.96). As noted above, 20 patients were re-administered the DASS 2 weeks following their initial intake evaluation. These patients had the following principal diagnoses: panic disorder (n = 7), GAD (n = 4), major depression (n = 4), social phobia (n = 2), simple phobia (n = 2), OCD (n = 1). As shown in Table 2, test–retest correlations indicated that all three scales evidenced favorable temporal stability (range of rs = 0.71–0.81). Because test–retest correlations would fail to detect any systematic increase or decrease in scores over time, paired t-tests were conducted as another test of temporal stability. These t-tests were nonsignificant for all three DASS scales (Table 2).

Factor structure. Because the factor structure of the DASS has been examined using nonclinical participants in prior studies (Lovibond & Lovibond, 1995), exploratory factor analysis was used to examine the structure of the scale in a clinical sample. Using the entire study sample (N = 437), principal components extraction with varimax rotation was performed (orthogonal rotation was used to assist in the interpretation and description of the resulting factor loadings). Selection of the number of factors to be rotated was based on conjunctive criteria requiring: (a) the eigenvalue of the factor to be greater than 1; and (b) the use of the scree test (Cattell, 1966). These criteria indicated a three-factor solution that accounted for 55% of the item variance (eigenvalues = 16.64, 3.96 and 2.53). Factor loadings for the 42 items are presented in Table 3. The first factor, Depression, reproduced the DASS-Depression scale exactly (i.e. the 14 items comprising the DASS-Depression scale were the only items to load on this factor). The range of factor loadings (after varimax rotation) was 0.83–0.59; there were no double-loading items ('double-loading' was operationalized as secondary loadings of 0.40 or greater). The second factor, Stress, reproduced the DASS-Stress scale exactly with the exception of one item. The first 14 items to load on this factor corresponded to the 14 items of the DASS-Stress scale (range of factor loadings = 0.76–0.51); one of these items also loaded on the Anxiety factor (factor load-

*To obtain copies of the instrument and manual, contact P.F. Lovibond, School of Psychology, University of New South Wales, Sydney, NSW 2052, Australia.

Table 2. Reliability of the DASS: temporal stability (2-week; $n = 20$)

	Time 1		Time 2			
	M	SD	*M*	SD	*r*	*t*
DASS-Depression	10.65	9.30	11.35	9.25	0.713***	−0.45
DASS-Anxiety	10.90	8.12	11.35	9.06	0.785***	−0.35
DASS-Stress	21.10	11.15	19.40	12.45	0.813***	1.04

***$P < 0.001$.

Table 3. Factor structure of the DASS

	Factor		
	Depression	Stress	Anxiety
DASS-Depression items			
2	**0.592 (0.576)**	0.308 (0.169)	0.141 (0.002)
5	**0.660 (0.646)**	0.348 (0.203)	0.115 (0.051)
12	**0.817 (0.871)**	0.208 (0.013)	0.119 (0.036)
13	**0.821 (0.870)**	0.233 (0.017)	0.111 (0.051)
16	**0.774 (0.792)**	0.252 (0.026)	0.247 (0.102)
17	**0.828 (0.899)**	0.132 (0.123)	0.188 (0.057)
20	**0.817 (0.893)**	0.127 (0.116)	0.145 (0.012)
23	**0.697 (0.673)**	0.365 (0.193)	0.207 (0.042)
25	**0.734 (0.743)**	0.300 (0.118)	0.141 (0.022)
26	**0.661 (0.637)**	0.359 (0.205)	0.169 (0.006)
31	**0.785 (0.832)**	0.196 (0.027)	0.163 (0.021)
32	**0.785 (0.805)**	0.282 (0.075)	0.170 (0.008)
36	**0.736 (0.765)**	0.218 (0.008)	0.190 (0.052)
41	**0.812 (0.889)**	0.106 (0.147)	0.176 (0.053)
DASS-Stress items			
1	0.297 (0.138)	**0.588 (0.581)**	0.211 (0.051)
6	0.304 (0.136)	**0.576 (0.540)**	0.322 (0.176)
8	0.104 (0.095)	**0.606 (0.653)**	0.237 (0.104)
10	0.300 (0.116)	**0.679 (0.694)**	0.189 (0.005)
11	0.333 (0.150)	**0.698 (0.709)**	0.182 (0.013)
14	0.294 (0.100)	**0.730 (0.767)**	0.141 (0.059)
21	0.295 (0.104)	**0.725 (0.764)**	0.127 (0.075)
22	0.158 (0.040)	**0.598 (0.610)**	0.318 (0.188)
27	0.108 (0.099)	**0.572 (0.580)**	0.383 (0.272)
28	0.198 (0.012)	**0.659 (0.715)**	0.122 (0.050)
34	0.285 (0.115)	**0.509 (0.432)**	**0.480 (0.370)**
37	0.231 (0.044)	**0.568 (0.536)**	0.398 (0.273)
40	0.236 (0.014)	**0.756 (0.798)**	0.225 (0.036)
42	0.208 (0.030)	**0.686 (0.769)**	0.006 (0.187)
DASS-Anxiety items			
3	0.046 (0.026)	0.023 (0.108)	**0.584 (0.636)**
4	0.167 (0.070)	0.144 (0.009)	**0.638 (0.650)**
7	0.088 (0.034)	0.233 (0.147)	**0.517 (0.506)**
9	0.204 (0.048)	**0.421 (0.349)**	**0.478 (0.400)**
15	0.134 (0.050)	0.132 (0.011)	**0.521 (0.527)**
18	0.050 (0.084)	0.215 (0.117)	**0.611 (0.620)**
19	0.259 (0.155)	0.227 (0.069)	**0.613 (0.589)**
24	0.128 (0.018)	0.131 (0.034)	**0.734 (0.765)**
29	0.045 (0.022)	0.030 (0.087)	**0.523 (0.566)**
30	0.278 (0.176)	0.343 (0.262)	0.338 (0.253)
33	0.266 (0.168)	0.226 (0.074)	**0.578 (0.549)**
35	0.152 (0.007)	0.298 (0.161)	**0.735 (0.723)**
38	0.200 (0.082)	0.197 (0.028)	**0.719 (0.723)**
39	0.138 (0.034)	0.140 (0.012)	**0.670 (0.691)**

Note: Factor loadings after varimax rotation of three factors extracted by principal components extraction (factor loadings after oblique rotation are provided in parentheses); factor loadings of 0.40 are presented in bold-face type. Decision to rotate three factors was based on criteria requiring: (a) the eigenvalue of the factor be greater than 1; and (b) the use of the scree test (eigenvalues for the first 10 factors were 16.64, 3.96, 2.53, 1.32, 1.15, 1.05, 0.96, 0.88, 0.84, 0.82).

ing = 0.48; item 34: "I was in a state of nervous tension"). The last item to load on the Stress factor was an item from the DASS-Anxiety scale (item 30: "I feared that I would be 'thrown' by some trivial but unfamiliar task"). However, this item loaded weakly on the Stress factor (0.343) and loaded with similar magnitudes on the Depression (0.278) and Anxiety (0.338) factors. Finally, the third factor, Anxiety, reproduced the DASS-Anxiety scale exactly, with the exception of item 30, noted above, which loaded on the Stress factor. The range of factor loadings of the 13 items comprising the Anxiety factor was 0.74–0.48. One double loading item was observed. The last item to load on the Anxiety factor also loaded on the Stress factor (0.42; item 9: "I found myself in situations which made me so anxious that I was most relieved when they ended").

To rule out the possibility that the solution and factor loadings obtained would vary considerably as a function of the rotational method employed, the DASS items were resubmitted to principal components analysis with oblique (oblimin) rotation. This analysis produced a factor structure identical to the structure obtained after orthogonal rotation (i.e. the three DASS scales were reproduced exactly, except for item 30 which had its highest loading on the Stress factor, but had loadings of similar magnitudes on the other two factors). Factor loadings following oblique rotation are also presented in Table 3. The correlations among the three factors were: Depression–Anxiety = 0.38; Anxiety–Stress = 0.46; Depression–Stress = 0.54.

In addition, zero-order correlations were calculated for the three DASS scales (using the original scoring method outlined in Lovibond & Lovibond, 1995). Correlations among the three DASS scales were: Depression–Anxiety = 0.51; Anxiety–Stress = 0.65; Depression–Stress = 0.64.

Comparisons of anxiety and mood disorder groups. One-way analyses of variance (ANOVAs) were conducted to evaluate the extent to which the DASS scales distinguished the various anxiety and mood disorder groups. Six principal diagnoses were used in these analyses: panic disorder, GAD, social phobia, simple phobia, OCD, and mood disorder (major depression or dysthymia). Comorbid diagnoses were not accounted for in the analyses, to enhance the external validity of these comparisons (i.e. given that comorbidity is quite prevalent in clinical samples of patients with anxiety or mood disorders, excluding comorbid cases would compromise generalizability; cf. Brown & Barlow, 1992).

It was predicted that the mood disorder group would obtain significantly higher scores on DASS-Depression relative to all of the anxiety disorder groups. As noted in Table 4, this prediction was supported. The significant omnibus effect from the ANOVA, $F(5,342) = 13.80$, $P < 0.001$, was further examined with Duncan's multiple range tests. These *post hoc* tests indicated that the mood disorder group had significantly higher DASS-Depression scores than the other five groups. In addition, patients with a principal diagnosis of simple phobia had significantly lower DASS-Depression scores than the other groups.

A significant between-groups effect was also observed for the DASS-Anxiety scale, $F(5,342) = 7.80$, $P < 0.001$. Because the DASS-Anxiety scale emphasizes enduring anxiety,

Table 4. Comparisons of anxiety and mood disorder groups on the DASS

		Principal DSM-III-R Diagnosis						
DASS scale		PD/A (1)	GAD (2)	SOC (3)	SIM (4)	OCD (5)	MOOD (6)	Simple effects[a]
Depression	*M*	11.63	14.33	13.17	4.95	16.45	25.31	6 > all groups
	SD	10.37	9.77	10.30	5.51	12.14	10.24	4 < all groups
Anxiety	*M*	15.48	11.34	11.66	5.25	9.65	10.97	1 > all groups
	SD	8.81	8.17	8.59	6.24	7.75	7.89	4 < 1,2,3,6
Stress	*M*	18.25	22.36	17.73	12.30	18.60	22.57	2,6 > 1,3,4
	SD	9.87	9.90	10.45	9.06	7.84	8.62	4 < 1,2,3,6

Note: PD/A = panic disorder with or without agoraphobia ($n = 149$); GAD = generalized anxiety disorder ($n = 63$); SOC = social phobia ($n = 59$); SIM = simple phobia ($n = 20$); OCD = obsessive–compulsive disorder ($n = 20$); MOOD = mood disorder (major depression, dysthymia; $n = 35$).

[a]All main effects significant at $P < 0.001$. Simple effects evaluated with Duncan's multiple ranges tests.

autonomic arousal, and fearfulness, it was expected that patients with panic disorder should evidence the highest scores on this measure. This prediction was supported by *post hoc* testing (see Table 4). In addition to the finding that patients with a principal diagnosis of panic disorder scored higher than all other groups on DASS-Anxiety, it was once again observed that patients with simple phobia scored significantly lower on this scale than all groups, with the exception of OCD.

Finally, the ANOVA comparing the six diagnostic groups on the DASS-Stress scale was also significant, $F(5,342) = 4.77$, $P < 0.001$. As noted earlier, our previous work with the DASS has suggested that the Stress scale is a measure of symptoms that are associated with chronic worry, such as muscle tension and irritability (cf. Brown *et al.*, 1994, 1995). Thus, it was predicted that patients with a principal diagnosis of GAD would score highest on this measure. *Post hoc* tests indicated that, in fact, both patients with GAD and patients with mood disorders obtained significantly higher DASS-Stress scores than the remaining groups, except for OCD. The only other between-groups difference noted was that patients with simple phobia had significantly lower DASS-Stress scores than all groups except patients with OCD.

Discussion

The results of Study 1 provide strong support for the internal consistency of the three DASS scales in a clinical sample, both across and within the various anxiety and mood disorder groups. A favorable degree of temporal stability was also noted in the three DASS scales, despite the fact that a certain degree of fluctuation would be expected in patients' responses given the 1-week time reference in the DASS instructions. In addition, results of an exploratory factor analysis of the 42 DASS items produced a factor structure that was quite similar to that previously obtained in a nonclinical sample (Lovibond & Lovibond, 1995). Although a few double-loading items were observed, only one of the 42 DASS items (item 30) loaded on a factor that was inconsistent with prediction (i.e. an item from the DASS-Anxiety scale loaded slightly higher on the Stress factor). Interestingly, the same offending item was found in exploratory factor analyses recently conducted by Lovibond and Lovibond (1995) in a nonclinical sample. This consistency, as well as the observation in the present study that this item loaded weakly on all three DASS factors (range = 0.28–0.34, after orthogonal rotation), might suggest deletion or revision of this item in any future iteration of the DASS scales.*

Further empirical support for the three DASS scales was provided by their ability to differentiate various DSM-III-R anxiety and mood disorder groups in the predicted direction. In fact, these comparisons could be viewed as a stringent test of DASS scale discriminability because comorbid anxiety and mood disorder diagnoses were accounted for in the analyses (e.g. patients with a principal diagnosis of panic disorder were differentiated from other anxiety and mood disorder groups on the DASS-Anxiety scale, despite the fact that many of the patients in these comparison groups likely had panic disorder as an additional diagnosis, cf. Brown & Barlow, 1992). Nevertheless, the results of these comparisons provided additional support for validity of the DASS scales as indices of hyperarousal/fearfulness (i.e. DASS-Anxiety differentiated patients with panic disorder from the other diagnostic groups), depression (i.e. DASS-Depression differentiated patients with mood disorders from the other diagnostic groups), and tension/stress/negative affect (i.e. DASS-Stress differentiated patients with GAD and mood disorders from the other diagnostic groups).†

*In further support of this suggestion, a re-examination of the internal consistency of the DASS-Anxiety scale with item 30 omitted yielded a Cronbach's alpha of 0.89 ($N = 437$), indicating that the removal of this item did not affect the reliability of this scale.

†Moreover, it is noteworthy that the average DASS scores of patients with a principal diagnosis of simple phobia were within the range of DASS scores of large nonclinical samples (e.g. Lovibond & Lovibond, 1995), indicative of low levels of generalized emotional distress in this group.

STUDY 2

Method

Participants. Participants were 241 patients presenting for assessment and treatment at the Phobia and Anxiety Disorders Clinic, Center for Stress and Anxiety Disorders. Women constituted the larger percentage of the sample (59.3%); the average age of the sample was 35.14 yr (SD = 10.55, range = 18–64). Diagnoses were established with the Anxiety Disorders Interview Schedule for DSM-IV: Lifetime version (ADIS-IV-L; Di Nardo, Brown & Barlow, 1994), a structured interview designed to comprehensively evaluate current and lifetime DSM-IV (American Psychiatric Association, 1994) anxiety, mood, and substance use disorders, and selected somatoform disorders (e.g. hypochondriasis) as well as screen for the presence of other major disorders (e.g. psychotic). Findings of an initial study (N = 72) of the diagnostic reliability of the ADIS-IV-L for principal DSM-IV anxiety and mood disorders (i.e. calculated on the basis of two independent interviews) indicate good to excellent levels of interrater agreement [Di Nardo, Brown, Lawton & Barlow, 1995; κs = 0.93 for panic disorder/panic disorder with agoraphobia, 1.00 for specific phobia, 0.83 for GAD, 0.90 for OCD, 0.64 for social phobia, and 0.85 for mood disorder (major depression or dysthymia)].

As was the case in Study 1, in instances where the patient was deemed as meeting criteria for two or more diagnoses, the 'principal' diagnosis was the one that received the highest ADIS-IV-L clinical severity rating (0–8 scale) that indicated the diagnostician's judgment of the degree of distress and interference in functioning associated with the diagnosis (ranging from 0 = 'none' to 8 = 'very severely disturbing/disabling'). Participants' DSM-IV principal diagnoses were as follows: panic disorder with or without agoraphobia (n = 82); GAD (n = 18); social phobia (n = 37); specific phobia (n = 20); OCD (n = 16); mood disorder (collapsing across major depressive disorder and dysthymic disorder; n = 21); other (e.g. posttraumatic stress disorder, anxiety disorder NOS, co-principal diagnoses; n = 47).

Measures. Following the ADIS-IV-L, patients completed the following questionnaires: (a) the DASS; (b) Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger & Borkovec, 1990), a 16-item unidimensional measure of the trait of worry; (c) the Positive and Negative Affect Scales (PANAS; Watson, Clark & Tellegen, 1988), a 20-item measure of two primary dimensions of mood (positive and negative affect; patients were instructed to respond to PANAS items based on how they feel *in general*); (d) Beck Depression Inventory (BDI; Beck & Steer, 1987), a 21-item measure of depressive symptoms; and (e) Beck Anxiety Inventory (BAI; Beck & Steer, 1990), a 21-item measure of anxiety symptoms. For purposes of the correlational analysis of convergent and discriminant validity, ADIS-IV-L clinical severity ratings (0–8) were used for three disorders: panic disorder (with or without agoraphobia), GAD, and mood disorder (major depression or dysthymia). Patients who did not meet criteria for panic disorder, GAD, or mood disorder at a clinical or subclinical level were assigned clinical severity ratings of '0'.

Results

Confirmatory factor analysis. Consistent with the approach taken by Lovibond and Lovibond (1995) in their analysis of a college student sample, the structure of the DASS was examined further using confirmatory factor analysis. Four different factor models were evaluated using

Table 5. Fit indices for confirmatory factor analysis comparing one, two, three, and revised three-factor solutions for the DASS

	Models			
Fit index	One-factor	Two-factor	Three-factor	Revised three-factor
GFI	0.42	0.57	0.66	0.68
CFI	0.58	0.72	0.78	0.79
RMSEA	0.12	0.10	0.09	0.09
Standardized RMR	0.12	0.09	0.08	0.07
χ^2	3792.31	2818.93	2396.08	2291.84

Note: GFI = goodness of fit index; CFI = comparative fit index; RMSEA = root mean square error of approximation; RMR = root mean square residual.

LISREL 8.12a (Jöreskog & Sorbom, 1993): (1) a single-factor model; (2) a two-factor model (to assess the validity of the distinction between DASS-Depression and the other two DASS scales; i.e. a two-factor model whereby the DASS-Anxiety and Stress scales are collapsed into a single factor); (3) a three-factor model corresponding to the three DASS scales presented by Lovibond and Lovibond (1995); and (4) a revised three-factor model based on the results of the exploratory factor analysis conducted in Study 1 (i.e. representation of double-loading items in a three-factor model). In each of the models that involved more than one factor (i.e. Models 2–4), the factors were permitted to be correlated. Overall fit indices derived by LISREL for these four models are presented in Table 5. Nested χ^2 tests were conducted to compare the fit of the various models. Relative to the one-factor model, the two-factor model provided a significantly improved fit for the data, nested $\chi^2(1) = 973$, $P < 0.001$. Moreover, the three-factor model resulted in significantly improved fit over the two-factor model, nested $\chi^2(1) = 423$, $P < 0.001$. The range of loadings (completely standardized coefficients from the lambda-X matrix) for items comprising the three factors was: Depression = 0.57–0.87; Anxiety = 0.45–0.80; Stress = 0.60–0.79. However, examination of modification indices and standardized residuals arising from the confirmatory factor analysis of the three-factor model indicated points of ill-fit that were consistent with the results of the exploratory factor analysis conducted in Study 1. Hence, the revised three-factor model was fitted to the data. The revised model provided significant improvement in fit relative to the three-factor model presented by Lovibond and Lovibond (1995), nested $\chi^2(1) = 104$, $P < 0.001$.

The completely standardized coefficients from the phi matrix were examined from the confirmatory factor analysis of the three-factor model suggested by Lovibond and Lovibond (1995). This indicated the following intercorrelations among the three latent factors: Depression–Anxiety 0.48; Anxiety–Stress 0.68; and Depression–Stress 0.69.

Because a nonsignificant χ^2 is unlikely in the confirmatory factor analysis of multiple-item measures (e.g. due to correlated error among multiple items that load onto a small number of latent variables), a reference point to evaluate the goodness of fit of the aforementioned models was created. This was accomplished by conducting a three-factor exploratory factor analysis of the 42 DASS item responses of the Study 2 sample using the same estimation method used in the LISREL analyses: maximum likelihood. This exploratory factor analysis also generated a large χ^2 value, $\chi^2(738) = 1887$, $P < 0.001$. This value represents the lowest possible χ^2 value that could be obtained for a three-factor solution, where all items are free to load on all factors. Consistent with the results using a nonclinical sample (Lovibond & Lovibond, 1995), the χ^2

Table 6. Intercorrelations among DASS and other study measures ($N = 241$)

	DASS-Depression	DASS-Anxiety	DASS-Stress	Test of differential magnitude of *rs*[a]
DASS-Depression	—			
DASS-Anxiety	0.45	—		
DASS-Stress	0.66	0.66	—	
Beck Depression Inventory	0.75	0.49	0.61	D > S > A
Beck Anxiety Inventory	0.40	0.83	0.58	A > S > A
Penn State Worry Questionnaire	0.47	0.38	0.60	S > D, A
PANAS-Positive Affect	−0.45	−0.18	−0.20	D > A, S
PANAS-Negative Affect	0.57	0.63	0.72	S > D, A
ADIS-IV-L DEP clinical severity rating	0.65	0.19	0.35	D > S > A
ADIS-IV-L PD clinical severity rating	0.09	0.49	0.18	A > D, S
ADIS-IV-L GAD clinical severity rating	−0.01	0.04	0.17	S > D, A

Note: PANAS = Positive and Negative Affect Scales; ADIS-IV-L = Anxiety Disorders Interview Schedule for DSM-IV: Lifetime Version; DEP = depression (major depression or dysthymia); PD = panic disorder with or without agoraphobia; GAD = generalized anxiety disorder.

Correlations of 0.18 or greater are significant at $P < 0.01$.

[a]Tests of the relative strength of non-independent correlation coefficients conducted using the *z*-test procedure ($\alpha = 0.05$) presented by Meng *et al.* (1992); e.g. S > D, A = DASS-Stress scale is more strongly ($P < 0.05$) correlated with the criterion measure (e.g. Penn State Worry Questionnaire) than are the DASS-Depression and Anxiety scales, which do not differ in their strength of association with the criterion measure.

values of 2396 and 2291 for the confirmatory analyses of the three-factor and revised three-factor models, respectively, are relatively low, particularly in reference to the χ^2 values derived from the one and two-factor models.

Correlational analysis of convergent and discriminant validity. Table 6 presents intercorrelations among the three DASS scales and the correlations of the DASS scales with the other Study 2 measures. As shown in this table, the zero-order intercorrelations among the three DASS scales (*r*s = 0.45–0.66) were similar in magnitude to the completely standardized phi coefficients obtained in the confirmatory factor analysis of a three-factor model. Based on the empirical results and conceptual considerations discussed above, the following patterns of correlations were predicted between the DASS scales and the other study measures: (1) relative to the other two DASS scales, DASS-Depression would correlate more strongly with measures of depression (i.e. BDI, PANAS-Positive Affect, ADIS-IV-L clinical severity rating of mood disorder); (2) relative to the other DASS scales, DASS-Anxiety would correlate more strongly with indices of fearfulness/autonomic arousal (i.e. BAI, ADIS-IV-L clinical severity rating of panic disorder); and (3) relative to the other DASS scales, DASS-Stress would correlate more strongly with measures of worry (i.e. PSWQ, ADIS-IV-L clinical severity of GAD). A *z*-test procedure outlined by Meng, Rosenthal and Rubin (1992) was used to compare the magnitude of these dependent correlations.

As indicated in Table 6, each of these predictions was supported [e.g. the magnitude of the correlations between DASS-Depression and the BDI, PANAS-Positive Affect, and clinical severity rating of mood disorders was significantly higher (*P*s < 0.05) than the magnitude of the correlations between DASS-Anxiety and DASS-Stress and these three measures]. Although DASS-Stress correlated more strongly than the other DASS scales with measures of worry, its correlation with the ADIS-IV-L clinical severity rating of GAD was rather low ($r = 0.17$), likely due to some extent to the positive skewness observed in the GAD severity measure. Finally, as can be seen in Table 6, DASS-Stress correlated more strongly (*P*s < 0.05) with PANAS-Negative Affect ($r = 0.72$) than did DASS-Depression ($r = 0.57$) and DASS-Anxiety ($r = 0.63$).

Discussion

The results of Study 2 suggest an extremely stable factor structure for the DASS. The confirmatory analysis in an independent clinical sample upheld the results of the exploratory analyses in Study 1. Whereas a three-factor model provided the best fit for the data (relative to one and two-factor models), a revised three-factor model, guided by the results from an exploratory factor analysis conducted in Study 1, produced a significant improvement ($P < 0.001$) in model fit. This finding could be viewed in support of the suggestion made in Study 1 for the revision or deletion of a few DASS items to enhance the discrimination among the three DASS scales. Inspection of the phi coefficients arising from the confirmatory factor analysis of the three-factor model indicated that the pattern of intercorrelations among the latent DASS factors were similar to those identified in a nonclinical sample (Lovibond & Lovibond, 1995), with the Stress factor being more strongly correlated with the Anxiety and Depression factors, relative to the correlation between the Anxiety and Depression factors (however, none of these coefficients indicated that the DASS scales were assessing highly overlapping constructs). Interestingly, the overlap observed in the Depression and Anxiety factors in the present clinical sample (phi = 0.48) was lower than the association observed between these two factors in the nonclinical sample (phi = 0.61) studied by Lovibond and Lovibond (1995). Nevertheless, the uniformity of support for this factor structure maintains the notion that these domains represent continuously distributed phenomena that are not unique to clinical disorders (Vredenberg, Flett & Krames, 1993).

Adding to the results of the between-group comparisons conducted in Study 1, correlational analyses of the convergent and discriminant validity of the DASS scales highlighted some of these more useful features of the DASS in a clinical population. For example, DASS-Depression correlated strongly with depression severity, but only weakly with PD and GAD severity, demonstrating excellent discriminant validity of the scale and potential utility for discrimination among disorders. The pattern of correlations involving the DASS-Anxiety and DASS-Stress were also entirely consistent with prediction.

GENERAL DISCUSSION

Collectively, the results of Studies 1 and 2 provide strong support for the psychometric properties of the DASS (although future research should examine the extent to which the DASS scales are sensitive to clinical change). In addition to providing empirical justification for the use of this measure in clinical anxiety and mood disorder samples, these findings could also be interpreted as bolstering theory-based contentions of the relationship between anxiety and depression and the structure of emotional disorders. As noted earlier, the robustness of the three-factor DASS structure supports current, independently developed models that posit three factors or systems underlying the emotions of depression and anxiety (e.g. Clark & Watson, 1991b; Gray, 1987), although these data could be viewed as somewhat at odds with the findings of one study (Zinbarg *et al.*, 1994) that suggested a four-factor model comprised of depression, physiological arousal, negative affect, and anxiety.*

Nevertheless, a key strength of the DASS is its ability to assess these domains in a brief and psychometrically sound manner. However, the constructs measured by the DASS scales should not be regarded as entirely equivalent to the constructs specified in these models, such as the tripartite model of Clark and Watson (1991b). For instance, although correlational analyses conducted in Study 2 supported the convergent and discriminant validity of the DASS scales, the correlation of −0.45 between DASS-Depression and PANAS-Positive Affect indicates that the DASS-Depression scale is assessing aspects of the depressive domain in addition to low positive affect (e.g. loss of self-esteem, hopelessness; cf. Lovibond & Lovibond, 1995).

Current findings indicate that the DASS-Stress scale is strongly associated with the construct of general negative affect/distress, a domain that may coincide meaningfully with the common features of anxiety and depression (cf. Watson & Clark, 1984). Consequently, this scale may be a more accurate index of overall severity of negative emotion than more heterogeneous scales emanating from two-factor models of anxiety and depression (such as the Beck inventories and the Hamilton rating scales). Findings that indices such as the DASS-Stress are strongly associated with measures of both general negative affect and features of worry/GAD may ultimately have important implications for current conceptualizations of this disorder [e.g. models in which GAD is considered to be the 'basic' anxiety disorder, characterized by common features of emotional disorders (i.e. worry, negative affect) and an absence of the more discriminating features of low positive affect and autonomic arousal; cf Brown *et al.*, 1994; Borkovec, 1995].

Acknowledgements—The authors thank P. F. Lovibond for his comments on an earlier version of this paper.

REFERENCES

American Psychiatric Association (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., rev.). Washington, DC: Author.

American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Andrews, G. (1996). Comorbidity in neurotic disorders: The similarities are more important than the differences. In R. M. Rapee (Ed.), *Current controversies in the anxiety disorders* (pp. 3–20). New York: Guilford Press.

Barlow, D. H. (1991). Disorders of emotion. *Psychological Inquiry, 1*, 58–71.

Barlow, D. H., Chorpita, B. F., & Turovsky, J. (1996). Fear, panic, anxiety, and disorders of emotion. In D. A. Hope (Ed.), *Perspectives on anxiety, panic, and fear* (Vol. 43). Lincoln, NE: University of Nebraska Press.

Beck, A. T., & Steer, R. A. (1987). *Manual for the revised Beck Depression Inventory*. San Antonio, TX: Psychological Corporation.

Beck, A. T., & Steer, R. A. (1990). *Manual for the Beck Anxiety Inventory*. San Antonio, TX: Psychological Corporation.

Borkovec, T. D. (1995). The nature, functions, and origins of worry. In G. Davey & F. Tallis (Eds.), *Worrying: Perspectives on theory, assessment, and treatment* (pp. 5–33). New York: Wiley.

Brown, T. A. (1996). Validity of the DSM-III-R and DSM-IV classification systems for anxiety disorders. In R. M. Rapee (Ed.), *Current controversies in the anxiety disorders* (pp. 21–45). New York: Guilford Press.

*Nevertheless, in Zinbarg *et al.* (1994), principal components factor analysis of ratings of various symptoms of anxiety and mood disorders (e.g. Hamilton rating scale items) yielded a three-factor solution, comprised of factors the authors labelled Physiological Arousal, Depression, and Anxiety. Items that had highest loadings on the Anxiety factor, but that also had salient loadings on the Depression factor were interpreted as representing a fourth factor, Negative Affect.

Brown, T. A., & Barlow, D. H. (1992). Comorbidity among anxiety disorders: Implications for treatment and DSM-IV. *Journal of Consulting and Clinical Psychology, 60,* 835–844.

Brown, T. A., Barlow, D. H., & Liebowitz, M. R. (1994). The empirical basis of generalized anxiety disorder. *American Journal of Psychiatry, 151,* 1272–1280.

Brown, T. A., Marten, P. A., & Barlow, D. H. (1995). Discriminant validity of the symptoms constituting the DSM-III-R and DSM-IV associated symptom criterion of generalized anxiety disorder. *Journal of Anxiety Disorders, 9,* 317–328.

Cattell, R. B. (1966). *Handbook of multivariate experimental psychology.* Chicago: Rand McNally.

Clark, L. A., & Watson, D. (1991a). Theoretical and empirical issues in differentiating depression from anxiety. In J. Becker & A. Kleinman (Eds.), *Psychosocial aspects of mood disorders* (pp. 39–65). Hillsdale, NJ: Lawrence Erlbaum Associates.

Clark, L. A., & Watson, D. (1991). Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology, 100,* 316–336.

Di Nardo, P. A., & Barlow, D. H. (1988). *Anxiety Disorders Interview Schedule for DSM-III-R (ADIS-R).* Albany, NY: Graywind Publications.

Di Nardo, P. A., Brown, T. A., & Barlow, D. H. (1994). *Anxiety Disorders Interview Schedule for DSM-IV: Lifetime Version (ADIS-IV-L).* San Antonio, TX: Psychological Corporation.

Di Nardo, P. A., Brown, T. A., Lawton, J. K., & Barlow, D. H. (1995, November). *The Anxiety Disorders Interview Schedule-for DSM-IV Lifetime Version: Description and initial evidence for diagnostic reliability.* Paper presented at the meeting of the Association for Advancement of Behavior Therapy, Washington, DC.

Di Nardo, P. A., Moras, K., Barlow, D. H., Rapee, R. M., & Brown, T. A. (1993). Reliability of DSM-III-R anxiety disorder categories using the Anxiety Disorders Interview Schedule-Revised (ADIS-R). *Archives of General Psychiatry, 50,* 251–256.

Gray, J. A. (1987). *The psychology of fear and stress* (2nd ed.). Cambridge, U.K.: Cambridge University Press.

Jöreskog, K., & Sorbom, D. (1993). *LISREL 8.12a.* Chicago: Scientific Software.

Lovibond, S. H. (1983, May). *The nature and measurement of anxiety, stress, and depression.* Paper presented at the 18th annual conference of the Australian Psychological Society, University of Western Australia.

Lovibond, S. H., & Lovibond, P. F. (1993). *Manual for the Depression Anxiety Stress Scales (DASS).* Psychology Foundation Monograph (Available from the Psychology Foundation, Room 1005 Mathews Building, University of New South Wales, NSW 2052, Australia).

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33,* 335–342.

Marten, P. A., Brown, T. A., Barlow, D. H., Borkovec, T. D., Shear, M. K., & Lydiard, R. B. (1993). Evaluation of the ratings comprising the associated symptom criterion of DSM-III-R generalized anxiety disorder. *Journal of Nervous and Mental Disease, 181,* 676–682.

Meng, X. -L., Rosenthal, R., & Rubin, D. B. (1992). Comparing correlated correlation coefficients. *Psychological Bulletin, 111,* 172–175.

Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy, 28,* 487–495.

Vredenberg, K., Flett, G. L., & Krames, L. (1993). Analogue versus clinical depression: A critical reappraisal. *Psychological Bulletin, 113,* 327–344.

Watson, D., & Clark, L. A. (1984). Negative affectivity: The disposition to experience aversive emotional states. *Psychological Bulletin, 96,* 465–490.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54,* 1063–1070.

Zinbarg, R. E., Barlow, D. H., Liebowitz, M. R., Street, L., Broadhead, E., Katon, W., Roy-Byrne, P., Lepine, J., Teherani, M., Richards, J., Brantley, P., & Kraemer, H. (1994). The DSM-IV field trial for mixed anxiety depression. *American Journal of Psychiatry, 151,* 1153–1162.