Journal of Abnormal Psychology
1995, Vol. 104, No. 1, 15-25

0021-843X/95/$3.00

Testing a Tripartite Model: II. Exploring the Symptom Structure of Anxiety and Depression in Student, Adult, and Patient Samples

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L. A. Clark and D. Watson (1991) proposed a tripartite model of depression and anxiety that divides symptoms into 3 groups: symptoms of general distress that are largely nonspecific, manifestations of anhedonia and low positive affect that are specific to depression, and symptoms of somatic arousal that are relatively unique to anxiety. This model was tested by conducting separate factor analyses of the 90 items in the Mood and Anxiety Symptom Questionnaire (D. Watson & L. A. Clark, 1991) in 5 samples (3 student, 1 adult, 1 patient). The same 3 factors (General Distress, Anhedonia vs. Positive Affect, Somatic Anxiety) emerged in each data set, suggesting that the symptom structure in this domain is highly convergent across diverse samples. Moreover, these factors broadly corresponded to the symptom groups proposed by the tripartite model. Inspection of the individual item loadings suggested some refinements to the model.

Recently, clinicians and researchers have shown renewed interest in the relation between depression and anxiety (see D. A. Clark, Beck, & Stewart, 1990; Kendall & Watson, 1989; Maser & Cloninger, 1990). This interest has been sparked by persistent evidence that these two constructs are difficult to differentiate empirically. For example, studies have shown consistently that self-report measures of anxiety and depression are strongly interrelated in both clinical and nonclinical samples, with correlations typically in the .45 to .75 range (e.g., L. A. Clark & Watson, 1991; Costa & McCrae, 1992; Gotlib, 1984; Mendels, Weinstein, & Cochrane, 1972). Similarly, clinicians' and teachers' ratings of anxiety and depression are strongly correlated with one another (e.g., Moras, DiNardo, & Barlow, 1992; Wolfe et al., 1987; for a review, see L. A. Clark & Watson, 1991). Finally, substantial comorbidity has been observed between the mood and anxiety disorders (L. A. Clark, 1989; Maser & Cloninger, 1990; Sanderson, Beck, & Beck, 1990), leading some investigators to suggest the need for a new diagnostic category of mixed anxiety–depression (L. A. Clark & Watson, 1991; Zinbarg & Barlow, 1991; Zinbarg et al., 1994).

Tripartite Model

Three Symptom Groups

Why are anxiety and depression so strongly related, and how can they be better differentiated from one another? L. A. Clark and Watson (1991) reviewed the relevant literature and proposed a tripartite model that may provide a partial answer to these questions. In this model, symptoms of depression and anxiety are subdivided into three broad groups. First, many symptoms of both constructs are strong markers of a general distress or negative affect factor and are, therefore, relatively nonspecific. In other words, these symptoms are commonly experienced by both anxious and depressed individuals. This nonspecific group includes both anxious and depressed affect, as well as other symptoms (e.g., insomnia, restlessness, irritability, poor concentration) that are prevalent in both types of disorder. In the tripartite model, these nonspecific symptoms are primarily responsible for the strong association between measures of anxiety and depression.

Nevertheless, each construct is characterized also by a cluster of relatively unique symptoms. That is, symptoms reflecting anhedonia and the absence of positive emotional experiences (e.g., feeling disinterested in things, lacking energy, feeling that nothing is enjoyable, having no fun in life) are relatively specific to depression. In contrast, manifestations of somatic tension and arousal (e.g., shortness of breath, feeling dizzy or lightheaded, dry mouth, trembling or shaking) are relatively specific to anxiety.

L. A. Clark and Watson (1991) emphasized that all three types of symptoms must be included in a comprehensive assessment of these constructs. However, a key implication of the tripartite model is that depression and anxiety can be differentiated better by deemphasizing the importance of the nonspecific symptoms and by focusing more on the two unique symptom clusters.

Evidence for the Tripartite Model

The tripartite model was derived from three types of evidence (L. A. Clark & Watson, 1991). First, content analyses indicated

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This research is based in part on the MA theses of Kris Weber and Jana Smith Assenheimer under the supervision of David Watson.

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that anxiety scales with the best discriminant validity tended to measure the somatic symptoms of anxiety rather than anxious mood per se; in contrast, the most differentiating depression scales tended to assess the loss of interest or pleasure, as opposed to other manifestations of depression. The second line of evidence came from studies comparing anxious and depressed patients. In these analyses, only a small subset of symptoms reliably differentiated the patient groups. Specifically, autonomic manifestations of panic (e.g., dizziness, racing heart) and symptoms of melancholia (e.g., loss of pleasure, early morning awakening) were the most differentiating markers of anxiety and depression, respectively. The final line of evidence came from factor analytic studies that identified symptom dimensions reflecting the three main subgroups in the tripartite model. The identified dimensions consisted of a general neurotic factor that included feelings of inferiority and rejection, oversensitivity to criticism, and anxious and depressed affect; a specific depression factor that was defined by the loss of interest or pleasure, anorexia, crying spells, and suicidal ideation; and a specific anxiety factor that was marked by items reflecting tension, shakiness, and panic (see L. A. Clark & Watson, 1991).

In a companion article, Watson et al. (1995) reported the first direct test of the tripartite model using the Mood and Anxiety Symptom Questionnaire (MASQ; Watson & Clark, 1991) and other symptom and cognition measures. The MASQ includes three scales containing symptoms that, according to the tripartite model, should be relatively nonspecific. In addition, it contains two specific scales—Anhedonic Depression and Anxious Arousal—that assess anhedonia/low positive affect and somatic arousal, respectively. Consistent with the tripartite model, Watson et al. (1995) found that these specific scales provided the best differentiation of the constructs in each of five samples (three student, one adult, one patient). Furthermore, Anxious Arousal and Anhedonic Depression showed excellent convergent validity. For instance, factor analyses indicated that these scales were clear markers of the underlying constructs; moreover, hierarchical multiple regression analyses revealed that they contained the most target-construct variance, as well as the least nontarget variance. Overall, therefore, the data supported the tripartite model by demonstrating that scales assessing anhedonia and somatic arousal showed excellent convergent and discriminant validity.

Current Study

This study provides the second direct test of L. A. Clark and Watson's (1991) tripartite model. Specifically, using the same five samples as in Watson et al. (1995), we explored the factor structure of the 90 anxiety and depression symptoms that comprise the MASQ. Although L. A. Clark and Watson's (1991) review revealed several studies that identified factors that appeared to reflect the three basic symptom groups proposed by the tripartite model, no study has investigated directly the degree to which the symptom structure in this domain actually corresponds to the model. Accordingly, this was the primary goal of this study.

The MASQ was constructed explicitly to test key aspects of the tripartite model and contains items from all three symptom groups. On the basis of the model, we expected to find evidence of three broad factors: (a) a general distress factor consisting of prominent symptoms of both anxiety and depression, including items reflecting both anxious and depressed mood; (b) a specific depression factor that is defined on one end by items reflecting energy, enthusiasm, and high positive affect, and on the other end by items reflecting anhedonia, loss of interest, and low positive affect; and (c) a specific anxiety factor that is most strongly marked by symptoms of somatic tension and arousal.

A second and related goal of this study was to evaluate the composition of the MASQ scales. As will be discussed shortly, the MASQ symptoms were rationally grouped into scales on the basis of their content: Items judged to be relatively nonspecific were placed into one of three "general distress" scales, whereas those viewed as relatively specific to depression or anxiety were included in Anhedonic Depression and Anxious Arousal, respectively. Clearly, however, some of these rational judgments may have been faulty; for example, an anxiety symptom that was thought to be relatively nonspecific actually might be a strong marker of the specific anxiety factor. Therefore, we examined the factor loadings of the MASQ items to determine whether each symptom was placed in the most appropriate scale.

The third goal of this study was not directly relevant to the tripartite model per se. We were interested in determining the extent to which the symptom structure in this domain is replicable across college student, normal adult, and psychiatric patient samples. This is an important and timely issue: Although considerable evidence in this area has been collected from all three types of participants, the extent to which they yield similar or dissimilar results remains unclear. This study provides evidence relevant to this issue by examining the replicability of symptom structure across these different populations.

Method

Participants

Three samples ("Student 1," "Student 2," and "Student 3") were comprised of undergraduates enrolled in psychology courses at Southern Methodist University: They contained 516 (208 men, 304 women, and 4 for whom information is unavailable), 381 (143 men, 234 women, and 4 unavailable), and 522 (206 men and 316 women) participants, respectively. (Because 86% of the Student 2 participants also had been included in the Student 1 sample, these ratings essentially represent a retest of the earlier assessment.) The adult sample contained 329 individuals (142 men and 187 women) with a mean age of 40.0 years. Most of the participants (78%) were employees of various businesses in the Dallas–Fort Worth metropolitan area; the others were visitors to a Dallas area hospital (9%) and members of local social and church groups (13%). Finally, the patient sample consisted of 470 consecutive admissions (453 men, 5 women, and 12 for whom information was unavailable) to the assessment unit of a comprehensive substance abuse treatment program at the Cleveland Department of Veterans Affairs Medical Center. Their mean age was 39.3 years. (For more information regarding these samples, see Watson et al., 1995.)

Measures

All participants completed the MASQ (Watson & Clark, 1991), which consists of 90 items culled from the symptom criteria for the anxiety and mood disorders (see Watson et al., 1995). Participants indi-

cated to what extent they had experienced each symptom (1 = *not at all,* 5 = *extremely*) "during the past week, including today."

Using the tripartite model as a conceptual guide, Watson and Clark (1991) initially grouped the MASQ items into six scales on the basis of their content. Paraphrased versions of the items—grouped according to their initial placement in these six scales—are presented in Table 6. Three MASQ scales contain symptoms that—according to the tripartite model—should be relatively nonspecific. The criteria of the revised third edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-III-R;* American Psychiatric Association, 1987) guided the placement of these general distress symptoms into the three scales; that is, the items were subdivided on the basis of whether they are included in the *DSM-III-R* criteria of (a) one or more anxiety disorders, (b) one or more mood disorders, or (c) both types of disorder. Thus, the General Distress: Mixed Symptoms (GD: Mixed) scale contains 15 items that appear in the symptom criteria of both the anxiety and mood disorders (e.g., insomnia). Conversely, the General Distress: Anxious Symptoms scale (GD: Anxiety; 11 items) includes several items reflecting anxious mood, as well as other symptoms of anxiety disorder that were expected to be relatively nondifferentiating. Finally, the General Distress: Depressive Symptoms scale (GD: Depression; 12 items) contains several indicators of depressed mood along with other relatively nonspecific symptoms of mood disorder.

The other three original MASQ scales contain symptoms that were hypothesized to be relatively specific to either anxiety or depression. First, Anxious Arousal (17 items) includes symptoms of somatic tension and hyperarousal (e.g., feeling dizzy or lightheaded, shortness of breath, dry mouth). This scale originally contained 19 items. However, a preliminary factor analysis in the Student 1 sample indicated that two of the items ("was afraid I was losing control," "felt like I was going crazy") actually loaded more strongly on the general distress factor than on the specific anxiety factor. Consequently, these items were eliminated from the scale.

The final two scales both contained items that were expected to be relatively specific to depression; initially, they were assessed separately to examine empirically whether they should be combined into a single scale. Loss of Interest originally contained 9 items that reflect anhedonia, disinterest, and low energy (e.g., "felt nothing was enjoyable"). One item ("felt like being alone") was dropped, however, because a reliability analysis in the Student 1 sample indicated that it was uncorrelated with the others.

The other scale—High Positive Affect—included 24 items that directly assessed positive emotional experiences (e.g., felt cheerful, optimistic; had a lot of energy; looked forward to things with enjoyment). These items were included in the MASQ on the basis of previous research indicating that it is desirable to assess high Positive Affect directly because these high-end items tend to be stronger, purer markers of the underlying factor than are items reflecting anhedonia and low Positive Affect (see Watson, Clark, & Carey, 1988; Watson & Kendall, 1989).

As noted earlier, the Loss of Interest and High Positive Affect items both were expected to be relatively specific to depression. Furthermore, these two scales were substantially interrelated, with a weighted mean correlation of −.53 across the five data sets (see Watson et al., 1995). Therefore, Watson and Clark (1991) created a new 22-item scale—Anhedonic Depression—that contained the 8 Loss of Interest items together with 14 of the (reverse-keyed) High Positive Affect items. This Anhedonic Depression scale was used as the specific depression measure in the analyses reported in Watson et al. (1995).

Results

Initial Factor Analyses

Exploring one- through eight-factor solutions. The 90 MASQ items were subjected to separate principal factor analyses (squared multiple correlations in the diagonal; communality estimates were not iterated) in each sample. Table 1 lists the eigenvalues for the first 15 unrotated factors in each solution. The most noteworthy aspect of these data is that the five solutions all showed a very similar pattern. Thus, we already see suggestive evidence of structural convergence across these samples.

Table 1
Eigenvalues of the First 15 Unrotated Factors in Each Sample

Factor number	Student 1 (n = 516)	Student 2 (n = 381)	Student 3 (n = 522)	Adult (n = 329)	Patient (n = 470)
1	20.91	20.52	21.28	25.01	26.85
2	7.43	8.12	7.58	8.23	6.44
3	2.73	3.34	2.70	3.68	3.38
4	2.59	2.60	2.12	1.91	1.81
5	1.47	1.82	1.92	1.79	1.36
6	1.34	1.47	1.44	1.59	1.26
7	1.26	1.36	1.32	1.53	1.09
8	1.08	1.15	1.13	1.42	1.03
9	0.99	1.06	1.02	1.16	0.88
10	0.98	1.03	0.91	1.08	0.84
11	0.90	0.94	0.90	0.96	0.78
12	0.78	0.88	0.79	0.92	0.74
13	0.73	0.86	0.74	0.82	0.67
14	0.70	0.80	0.69	0.80	0.62
15	0.67	0.75	0.65	0.72	0.62
Overall common variance	47.94	52.34	48.71	57.95	51.94

We initially explored a broad range of solutions. Specifically, we examined the full range of solutions up to and including eight factors, by which point it became clear that too many factors were being extracted (as we describe shortly). Starting with the two-factor solutions, all factors were rotated using varimax. Our initial inspection of the 1-factor solutions indicated that a very large general factor emerged in each data set; it was defined by the depression, anxiety, and general distress symptoms on one pole and by the positive emotionality items on the other. Virtually all of the items were salient markers of this dimension. The highly general nature of this factor is depicted in Table 2, which presents the mean number of markers (out of 90 items, averaged across the five samples) for each factor in each solution; in these and all subsequent analyses, a marker was defined as a variable that loaded |.30| or greater on a factor and had its highest loading on that factor. Table 2 indicates that, on average, 82.4 of the 90 items (92%) were significant markers of this general factor. It also should be noted, however, that the magnitude of the loadings varied widely across items. Averaged across the five solutions, four items had mean loadings less than |.30|, 44 had loadings between |.30| and |.50|, and 42 had loadings greater than |.50|; overall, the median loading on this first factor was |.48|.

Each of the samples also yielded a highly similar two-factor solution. In each case, one factor was a broad distress dimension that was defined most strongly by the anxiety and GD: Mixed symptoms, but also included many symptoms of depression. In contrast, the other factor was relatively specific to depression: It

Table 2
Mean Number of Markers (Averaged Across the Five Samples) for One- Through Eight-Factor Solutions

No. of factors in solution	Mean no. of markers for factor no.							
	1	2	3	4	5	6	7	8
1	82.4							
2	55.0	31.4						
3	30.8	29.6	24.8					
4	29.2	26.4	23.6	5.8				
5	26.4	25.2	20.0	10.2	3.8			
6	26.2	24.8	20.2	10.4	3.6	0.8		
7	27.6	24.6	19.8	7.2	5.0	1.6	1.0	
8	27.4	24.6	19.2	7.8	3.4	3.4	1.0	0.4

Note. A marker was defined as a variable that loaded |.30| or greater on a factor and had its highest loading on that factor. All factors (other than those in the one-factor solutions) were rotated using varimax.

was defined most strongly by the positive emotionality items on one end, and by symptoms of depression on the other. Clearly, these two factors resemble closely the negative affect and positive affect dimensions that have been identified by Tellegen (1985; Watson & Tellegen, 1985) and others. Table 2 indicates that both of these factors were quite large, averaging 55.0 and 31.4 markers, respectively.

For our purposes, the three-factor solutions were the most crucial. In each data set, these solutions yielded factors that appeared to correspond closely to the symptom groups comprising the tripartite model. In each sample, the factors consisted of: (a) a broad, nonspecific distress factor that included symptoms of both anxiety and depression; (b) a specific depression factor that was defined on one pole by the positive emotionality items and on the other by anhedonia and other symptoms of depression; and (c) a specific anxiety factor that was marked by items reflecting somatic arousal. As shown in Table 2, these factors were all large and roughly similar in size: Across the five samples, they averaged 30.8, 29.6, and 24.8 markers, respectively.

After three factors, the solutions diverged appreciably; in fact, no later factor could be identified consistently in all five samples. For instance, the fourth factor in the four-factor solutions was defined variously by items reflecting fatigue and poor concentration (Student 1 and Student 3 samples), laughing and talkativeness (Student 2 sample), and insomnia (adult and patient samples). Similarly, the fifth factor in the five-factor solutions was narrowly defined by insomnia and sleep items in two solutions (Student 2 and patient) and more broadly characterized by general distress symptoms in a third (adult); in the two remaining solutions (Student 1 and Student 3), however, it had no markers at all.

Note also that succeeding factors were substantially smaller than the first three, with few significant markers. For example, in the four-factor solutions the fourth factor had a mean of only 5.8 markers, and in the five-factor solutions the fifth factor averaged only 3.8 markers (see Table 2). Beyond five factors, all of the extracted dimensions were small and poorly defined. In this context, it is noteworthy that the first three factors remained large and well-defined even in later solutions. Thus, in the eight-factor solutions, the first three factors still averaged 27.4, 24.6, and 19.2 markers, respectively; in other words, the large majority of the anxiety and depression symptoms continued to define the first three factors, even as more and more factors were extracted.

Quantitative assessment of factor convergence. In summary, this initial evaluation suggested that the solutions were highly convergent up to and including three factors, but then diverged sharply from one another. Because factor replicability across different samples is a crucial consideration in determining the best solution (Everett, 1983), this suggests that no more than three factors be retained. Nevertheless, it is important that this conclusion be corroborated using more formal quantitative analyses. Two basic approaches for assessing factor similarity are computing congruence coefficients that are based on the factor loadings and correlating the factor scores that are generated by each solution (see Gorsuch, 1983; Harman, 1976). Because the issue of factor replicability is central to this article, we present findings using both approaches.

First, we considered evidence on the basis of factor scores. A factor solution generates a set of factor scoring weights (in this case, regression-based weights) for each of the extracted factors. A set contains a separate weight for each of the factored variables; these weights can then be multiplied against the participants' actual item responses to yield an overall score on that factor for each participant. For example, a two-factor solution generates two sets of weights that can be multiplied by the item responses to yield two factor scores for each participant; similarly, a three-factor solution yields three sets of weights that can be used to compute three factor scores, a four-factor solution yields four sets of weights (and thus four scores), and so on.

In these analyses, we had a series of solutions for each of five data sets. Thus, across the five samples, the one-factor solutions generated a total of five sets of factor scoring weights (one from each data set), the two-factor solutions yielded a total of 10 sets of factor scoring weights (2 from each data set), and so on. These weights can be used not only to compute factor scores in the data set from which they were derived, but also to create scores in any data set that contains all of the originally factored variables. In our analyses, we used them to compute factor scores in our largest data set, the Student 3 sample (N = 522). If the solutions are truly convergent across the different samples, then the factor scoring weights from each of the five data sets should produce corresponding factor scores that are highly correlated with each other. For instance, the weights from the five one-factor solutions should generate five scores that are very highly intercorrelated. Similarly, the weights from the two-factor solutions should produce two groups (one for each factor) of five scores (one from each data set); within each group, the five scores should be very highly interrelated.

Table 3 presents mean convergent correlations (i.e., those among scores within the same group that presumably reflect the same factor) for each factor in each solution. As was noted earlier, beyond three factors it was impossible to identify any factor consistently on the basis of content; we therefore matched later factors in such a way as to maximize the overall level of convergence in that solution.[1]

[1] It is frequently the case that factors emerge in different orders in different solutions, particularly as larger numbers of factors are ex-

Table 3
Assessing the Cross-Sample Convergence of One- Through Eight-Factor Solutions: Mean Convergent Correlations of Factor Scores From the Five Samples Computed in the Student 3 Data

Number of factors in solution	Factor number							
	1	2	3	4	5	6	7	8
1	**.99**	—						
2	**.99**	**.99**	—					
3	**.99**	**.93**	**.93**	—				
4	**.98**	**.93**	**.92**	.45	—			
5	**.92**	.86	**.95**	.59	.57	—		
6	**.92**	.84	**.94**	.56	.51	.18	—	
7	**.93**	**.90**	**.95**	.49	.74	.61	.42	—
8	**.92**	**.91**	**.94**	.53	.50	.76	.61	.50

Note. $N = 522$. Mean correlations of .90 or greater are shown in boldface.

Everett (1983) suggested that a correlation of .90 or greater indicates that the factors truly converge with one another. According to this criterion, the one- and two-factor solutions were both highly convergent. The five scores generated by the one-factor solutions had a mean convergent correlation of .99; similarly, the two-factor solutions yielded two groups of factors (one from each sample) that each had an average coefficient of .99.

The three-factor solution is the most crucial for the tripartite model. It is noteworthy, therefore, that the mean convergent correlations for this solution—.99, .93, and .93, respectively—easily meet Everett's (1983) criterion. In contrast, no succeeding factor even approached an acceptable level of convergence. In the four-factor solutions, the fourth factor had an average convergent correlation of only .45; in subsequent solutions, no factor beyond the third had a mean coefficient above .80.

Another interesting aspect of these data is that the first three factors remained highly convergent even as more and more factors were extracted. For instance, in the eight-factor solution, these factors still had mean coefficients of .92, .91, and .94, respectively. In other words, extracting additional factors did not substantially diminish the replicability of the first three. This pattern probably reflects the earlier finding that the first three factors remained large and well-defined even as more factors were extracted (see Table 2).

Solely on the basis of the factor similarity data, one can justify retaining one, two, or three factors. All three solutions yielded structures that were highly convergent across the five samples; beyond that, the structures diverged sharply. However, because the three-factor structure was predicted theoretically—and because the most differentiated structure is also likely to be the most clinically informative—we selected this solution for further examination.

tracted (for a discussion, see Everett, 1983). This was also true in our analyses. For instance, in some solutions the General Distress dimension emerged first, followed by the Positive Emotionality versus Depression factor; in other solutions, the order of these two factors was reversed. Accordingly, we matched the factors by the content of their marker items, rather than simply using the order in which they emerged. The factor numbers shown in Table 3 reflect the order in which the factors emerged in the Student 3 data.

Further Analyses of Convergence Among the Three-Factor Solutions

As predicted by the tripartite model, the dimensions comprising the three-factor structure appeared to consist of a nonspecific distress factor that included many symptoms of both constructs, a specific depression factor, and a specific anxiety factor. We therefore labeled these factors General Distress, Anhedonia Versus Positive Affect, and Somatic Anxiety, respectively. Before examining the content of these factors, we investigated the structural convergence among the five samples in more detail.

Factor score convergence between individual samples. We have seen already that the three-factor solutions showed an impressive level of convergence overall. However, the Table 3 data do not show how individual samples converged with one another. In this regard, one might wonder whether the three student samples produced extremely similar three-factor solutions but were somewhat less convergent with the adult and patient samples. Accordingly, Table 4 presents the convergent correlations for each of the individual factor scores in the Student 3 data.

Two aspects of the results are particularly noteworthy. First, virtually all of the individual factors showed strong convergence. Overall, 26 of the 30 convergent correlations (87%) were .90 or greater, and none was lower than .85. Second, con-

Table 4
Assessing the Cross-Sample Convergence of the Three-Factor Structure: Convergent Correlations of Factor Scores From the Five Samples Computed in the Student 3 Data

Factor score	1	2	3	4	5
	Factor 1 (Anhedonia vs. Positive Affect)				
1. Student 1	—				
2. Student 2	**.99**	—			
3. Student 3	**.99**	**.99**	—		
4. Adult	**.99**	**.99**	**.99**	—	
5. Patient	**.98**	**.99**	**.98**	**.99**	—
	Factor 2 (General Distress)				
1. Student 1	—				
2. Student 2	**.94**	—			
3. Student 3	**.96**	**.97**	—		
4. Adult	.88	**.96**	**.94**	—	
5. Patient	.85	**.94**	**.90**	**.96**	—
	Factor 3 (Somatic Anxiety)				
1. Student 1	—				
2. Student 2	**.93**	—			
3. Student 3	**.94**	**.97**	—		
4. Adult	.85	**.96**	**.93**	—	
5. Patient	.86	**.95**	**.92**	**.97**	—

Note. $N = 522$. Correlations of .90 or greater are shown in boldface.

Table 5
Assessing the Cross-Sample Convergence of the Three-Factor Structure: Congruence Coefficients Based on the Factor Loadings From the Five Solutions

Solution	1	2	3	4	5
		Anhedonia vs. Positive Affect			
1. Student 1	—				
2. Student 2	**.98**	—			
3. Student 3	**.99**	**.98**	—		
4. Adult	**.97**	**.97**	**.98**	—	
5. Patient	**.94**	**.95**	**.95**	**.95**	—
		General Distress			
1. Student 1	—				
2. Student 2	**.97**	—			
3. Student 3	**.97**	**.98**	—		
4. Adult	**.94**	**.96**	**.97**	—	
5. Patient	**.95**	**.96**	**.96**	**.97**	—
		Somatic Anxiety			
1. Student 1	—				
2. Student 2	**.93**	—			
3. Student 3	**.93**	**.97**	—		
4. Adult	.87	**.95**	**.94**	—	
5. Patient	**.91**	**.95**	**.94**	**.96**	—

Note. Congruence coefficients of .90 or greater are shown in boldface.

vergence between the student and nonstudent samples was only slightly lower than that among the various student groups. The mean convergent correlations among the three student samples were .99 (Anhedonia vs. Positive Affect), .96 (General Distress), and .95 (Somatic Anxiety). The corresponding coefficients between the adult and student samples were .99, .93, and .91, respectively; those between the patient and student samples were .98, .90, and .91, respectively. Finally, the adult and patient samples were strongly convergent, yielding correlations of .99, .96, and .97, respectively. Thus, the Table 4 data indicate that students, adults, and patients all generate extremely similar three-factor structures.[2]

Factor loading convergence. As mentioned earlier, a second approach to factor similarity is to compute congruence coefficients (Tucker, 1951) on the basis of the factor loadings in each solution. Congruence coefficients have the same range as correlations (i.e., from −1 to 1). Moreover, similar to correlations, factors that are presumed to be convergent should have highly positive coefficients with one another (i.e., .90 and above). It should be noted, however, that unlike correlations, congruence coefficients reflect not only the rank order and scatter of the factor loadings, but also their magnitude. Thus, for a congruence coefficient to approach unity, the loadings on two factors not only must show a very similar pattern, they must also be generally similar in size (see also Gorsuch, 1983; Harman, 1976).

Table 5 presents congruence coefficients among the factors that were judged to be convergent. These data essentially confirmed the earlier findings that were based on factor scores; if anything, they demonstrated a slightly higher level of replicability. Overall, 29 of the 30 congruence coefficients (97%) were above .90, and none was lower than .87. Furthermore, there was strong convergence across the student, adult, and patient samples, that is, the three student solutions produced mean congruence coefficients of .96 (General Distress), .97 (Anhedonia vs. Positive Affect), and .92 (Somatic Anxiety) with the adult factors, and corresponding values of .96, .95, and .93, respectively, with the patient factors. Similarly, the congruence coefficients between the adult and patient factors were .97, .95, and .96, respectively. Clearly, the three-factor structure was highly replicable across the different types of participants.

Three Replicated Factors

Orthogonal varimax rotation. Our analyses demonstrated an impressive level of convergence in the three-factor structure across the five samples. Next, we considered the nature of the predicted structure in more detail and examined the extent to which these three robust factors conformed to the symptom groups hypothesized in the tripartite model.

As stated earlier, we expected the three-factor structure to consist of (a) a general distress factor reflecting symptoms of both anxiety and depression, (b) a specific anxiety factor that is most strongly marked by symptoms of somatic tension and arousal, and (c) a specific depression factor that is defined on one end by items reflecting energy, enthusiasm, and high positive affect, and on the other end by items reflecting anhedonia, loss of interest, and low positive affect. In terms of specific scales and symptoms, we therefore predicted that all 38 items comprising the three GD scales (GD: Mixed, GD: Anxiety, GD: Depression) would load primarily on a common general distress factor. Note, however, that many of these items also might have significant secondary loadings (i.e., |.30| or greater) on one of the specific factors; for instance, some of the GD: Anxiety symptoms might load secondarily on the somatic anxiety factor, whereas some GD: Depression items might load significantly on the specific depression factor.

In addition, we predicted that the 17 retained Anxious Arousal symptoms all would load primarily on the specific anxiety factor; again, however, some of these items also might have significant secondary loadings on another factor. No predictions were made regarding the two items that were dropped from Anxious Arousal.

Finally, we expected the 24 High Positive Affect items to define one end of the specific depression factor. The expected pattern for the eight retained Loss of Interest items was less clear, however. As noted earlier, the high-end items tend to be stronger, purer markers of the underlying factor than are items reflecting anhedonia and low Positive Affect (see Watson et al., 1988; Watson & Kendall, 1989). Accordingly, it is uncertain whether the Loss of Interest items should be expected to load primarily on

[2] As noted earlier, these factor scores can be computed in any of our data sets. Accordingly, we repeated these analyses in the four remaining samples and obtained virtually identical results. That is, in the other four samples the three factors produced mean convergent correlations ranging from .98 to .99 (Anhedonia vs. Positive Affect), from .92 to .95 (General Distress), and from .92 to .95 (Somatic Anxiety). It is interesting to note that the best overall convergence was obtained using the patient data (mean *r*s = .98, .95, and .95, respectively).

the specific depression factor or, alternatively, on the general distress factor. Clearly, however, these items should load significantly on the specific depression factor; moreover, they should have relatively stronger loadings on this factor than the GD: Depression symptoms.

With these predicted patterns in mind, Table 6 presents the mean varimax-rotated loading for each item (computed across all five solutions) on each of the three replicated factors. The most noteworthy aspect of these data is that although there are several unpredicted findings, the overall structure is broadly consistent with the tripartite model. That is, we see clear evidence of (a) a General Distress factor that is defined by many symptoms of both depression and anxiety, (b) a specific anxiety factor that is most strongly marked by numerous somatic items, and (c) a specific depression factor that is characterized by the High Positive Affect items on one pole and by various depressive symptoms on the other.

We now consider each of the factors in more detail. First, as expected, the large majority of the GD items loaded strongly on the General Distress factor. Overall, 29 of the 38 GD symptoms (76%) loaded significantly on this factor; moreover, 27 of these items had their highest loading on it. Support for the tripartite model was particularly strong among the GD: Depression symptoms, all of which were markers of this factor. Note, however, that over half of the symptoms on the other two GD scales (i.e., 9 of 15 GD: Mixed items, 6 of 11 GD: Anxiety items) also loaded most highly on General Distress. Finally, six Loss of Interest items and the two discarded Anxious Arousal symptoms also marked this factor.

On the other hand, several of the GD items did not behave as predicted. One reverse-keyed GD: Mixed item ("slept very well") did not load significantly on any factor. Five additional GD: Mixed symptoms had low to moderate loadings (i.e., in the .20 to .45 range) on both General Distress and Somatic Anxiety. The most striking pattern, however, was exhibited by five somatic symptoms (e.g., "lump in throat," "tense or sore muscles") from the GD: Anxiety scale. Although clearly somatic, these items were not placed in Anxious Arousal because they did not appear to reflect autonomic hyperarousal as strongly as many other anxiety symptoms. Contrary to our expectations, however, these items were markers of the specific anxiety factor (with loadings ranging from .37 to .54), and did not load significantly on General Distress (loadings ranged from only .11 to .24).

Turning to Somatic Anxiety, Table 6 indicates that 16 of the 17 retained Anxious Arousal items (94%) were clear markers of this factor, with loadings ranging from .39 to .66; the only item that did not show the expected pattern ("easily startled") split evenly between this factor and General Distress. In addition, as described earlier, five somatic GD: Anxiety symptoms loaded primarily on this factor. Finally, seven items from other scales (five from GD: Mixed, two from Loss of Interest) also were markers of this dimension. Thus, the factor that emerged was somewhat broader than expected; most notably, it included several somatic items that do not appear to reflect a strong state of perceived arousal. Having said this, however, we must also emphasize that the Anxious Arousal scale contributed 14 of the 16 items that loaded .50 or higher on this factor. In other words, the strongest, clearest markers of this factor were, in fact, the symptoms predicted by the model.

Finally, as expected, the specific depression factor was the only one that was strongly bipolar. Consistent with our prediction, 23 of the 24 High Positive Affect items (96%) clearly defined the high end of this factor, with loadings ranging from .47 to .76 (the one deviant item, "felt I didn't need much sleep," failed to load significantly on any factor). In addition, 10 symptoms had significant secondary loadings on the low end of this factor: Six were from GD: Depression, three were from Loss of Interest, and one was from GD: Mixed. Put another way, nine of the 20 depression symptoms (45%; this figure excludes the one dropped Loss of Interest item) had significant secondary loadings on this dimension. In contrast, no anxiety symptoms loaded significantly on this factor; in fact, the mean loading across the 30 items that were originally included in either GD: Anxiety or Anxious Arousal was only −.05. These findings strongly support the identification of this dimension as a specific depression factor that is unrelated to anxiety.

It is also noteworthy that the GD: Depression and Loss of Interest items tended to load quite similarly on this factor. In fact, the 12 GD: Depression symptoms had loadings ranging from −.19 to −.35, with a mean value of −.28, whereas the eight retained Loss of Interest symptoms had loadings ranging from −.17 to −.40, with an average value of −.27. Thus, we see no evidence that the Loss of Interest items were more strongly related to the specific depression factor. However, consistent with our model, these items tended to be less strongly saturated with general distress variance. That is, the GD: Depression items had loadings ranging from .41 to .64 on the General Distress factor, with an average value of .55; in contrast, the corresponding loadings for the eight retained Loss of Interest items ranged from .14 to .49, with a mean of .40. Hence, consistent with our prediction, the Loss of Interest items have a higher proportion of specific factor variance.

Oblique promax rotation. One could argue that oblique rotation (in which the factors are allowed to be correlated) might provide a more realistic representation of the symptom structure in this domain. Accordingly, we also subjected the three-factor solutions to oblique promax rotations in which the varimax loadings were raised to a power of 3 (see Gorsuch, 1983; Hendrickson & White, 1964). The resulting factors correlated .49 (General Distress vs. Anhedonia/Positive Affect), .58 (General Distress vs. Somatic Anxiety), and .23 (Anhedonia/Positive Affect vs. Somatic Anxiety). Nevertheless, these oblique rotations produced factors that are highly similar to those displayed in Table 6. The only notable difference was that the Anhedonia/Positive Affect factor was less strongly bipolar in the oblique solutions: Specifically, although this factor continued to be strongly defined by the High Positive Affect items on one end, the depression symptoms had weaker loadings on the other.

Discussion

Evidence Regarding the Tripartite Model

The results of this study offer broad support for the tripartite model proposed by L. A. Clark and Watson (1991). In this model, symptoms of depression and anxiety are divided into

Table 6
Mean Varimax-Rotated Factor Loadings of the MASQ Items Averaged Across the Five Solutions

MASQ Scale/item	Mean loading on General Distress	Anhedonia–Positive Affect	Somatic Anxiety
General Distress: Mixed Symptoms			
Worried a lot about things	**.63***	−.22	.17
Trouble concentrating	**.60***	−.08	**.33**
Felt dissatisfied with things	**.59***	**−.33**	.24
Felt confused	**.55***	−.14	.23
Felt irritable	**.53***	−.20	.28
Trouble making decisions	**.52***	−.09	.29
Trouble paying attention	**.49***	−.05	**.38**
Felt restless	**.45***	.05	.29
Felt something awful would happen	**.44***	−.21	**.36**
Got fatigued easily	**.40**	−.20	**.42***
Trouble remembering things	**.31**	−.06	**.39***
Trouble falling asleep	.29	−.05	**.35***
Trouble staying asleep	.25	−.11	**.40***
Loss of appetite	.22	−.02	**.31***
Slept very well[a]	−.16	.26*	−.21
General Distress: Depressive Symptoms			
Felt depressed	**.64***	**−.35**	.18
Felt discouraged	**.61***	**−.31**	.16
Felt sad	**.60***	−.27	.10
Felt hopeless	**.59***	**−.34**	.25
Disappointed in myself	**.58***	−.28	.18
Felt like crying	**.57***	−.23	.17
Felt like a failure	**.57***	**−.32**	.22
Felt worthless	**.55***	**−.32**	.20
Blamed myself for things	**.54***	−.20	.21
Felt inferior to others	**.54***	−.19	.21
Pessimistic about the future	**.44***	**−.30**	.17
Felt tired or sluggish	**.41***	−.19	**.36**
General Distress: Anxious Symptoms			
Felt tense, "high-strung"	**.57***	.01	**.32**
Felt uneasy	**.55***	−.19	**.31**
Felt nervous	**.54***	−.04	.22
Felt afraid	**.51***	−.08	.18
Felt "on edge," keyed up	**.51***	.04	**.38**
Unable to relax	**.50***	−.09	**.31**
Lump in my throat	.24	−.09	**.54***
Upset stomach	.23	−.05	**.53***
Tense or sore muscles	.22	.01	**.42***
Felt nauseous	.20	−.06	**.47***
Had diarrhea	.11	.00	**.37***
Loss of Interest			
Felt unattractive	**.49***	−.24	.19
Felt nothing was enjoyable	**.48***	**−.40**	**.30**
Felt withdrawn from others	**.47***	**−.33**	.27
Took extra effort to get started	**.43***	−.19	.27
Felt slowed down	**.39**	−.24	**.41***
Nothing was interesting or fun	**.35***	**−.32**	.28
Felt bored	**.32***	−.17	.19
Thought about death, suicide	.28	−.25	**.34***
Felt like being alone[b]	.14	.19*	.03
Anxious Arousal			
Felt dizzy, lightheaded	.19	−.04	**.66***
Was trembling, shaking	.25	−.07	**.63***
Shaky hands	.23	−.09	**.58***
Trouble swallowing	.04	−.08	**.57***
Short of breath	.15	.00	**.56***
Dry mouth	.18	−.03	**.55***
Twitching or trembling muscles	.19	.01	**.55***
Hot or cold spells	.22	−.05	**.52***
Cold or sweaty hands	.13	−.05	**.52***
Felt like I was choking	.02	−.09	**.51***

Table 6 (*continued*)

MASQ Scale/item	Mean loading on: General Distress	Anhedonia–Positive Affect	Somatic Anxiety
Felt faint	.17	−.05	**.51***
Pain in chest	.08	−.07	**.51***
Racing or pounding heart	**.34**	.09	**.51***
Felt numbness or tingling	.13	−.03	**.50***
Afraid I was going to die	.14	−.09	**.39***
Had to urinate frequently	.22	.06	**.39***
Was afraid I was losing control[b]	**.46***	−.17	**.38**
Felt like I was going crazy[b]	**.55***	−.17	**.32**
Easily startled	**.31***	.03	**.31***
High Positive Affect			
Felt really lively, "up"[c]	−.08	**.76***	−.06
Felt really happy[c]	−.16	**.72***	−.08
Felt I had a lot of energy[c]	−.08	**.71***	−.07
Was having a lot of fun[c]	−.09	**.69***	.05
Felt I had much to look forward to[c]	−.15	**.68***	−.07
Felt good about myself[c]	**−.32**	**.68***	−.04
I had many interesting things to do[c]	−.13	**.66***	−.02
Felt confident	**−.34**	**.65***	−.04
Looked forward to things[c]	−.10	**.64***	−.03
Felt I had accomplished a lot[c]	−.19	**.63***	.00
Was proud of myself[c]	−.23	**.63***	.03
Felt cheerful[c]	−.13	**.62***	−.11
Felt successful	−.24	**.62***	.03
Felt optimistic[c]	−.14	**.59***	.00
Felt really talkative	.09	**.58***	−.02
Moved quickly and easily[c]	−.10	**.57***	−.12
Felt hopeful about future[c]	−.19	**.56***	−.03
Able to laugh easily	−.07	**.53***	−.11
Felt like being with others	.00	**.52***	−.13
Felt very clearheaded	−.24	**.52***	−.16
Thoughts came to me very easily	−.11	**.51***	−.09
Felt very alert	−.15	**.49***	−.18
Could do everything I needed to	−.29	**.47***	−.07
Felt I didn't need much sleep	.07	.15	.20*

Note. Loadings of |.30| or greater are shown in boldface. An asterisk indicates the highest loading for that item. MASQ = Mood and Anxiety Symptom Questionnaire.
[a] Reverse-keyed item. [b] Item was originally included in scale but later eliminated; see text for more details.
[c] Selected as a reverse-keyed item for the Anhedonic Depression scale.

three groups: nonspecific symptoms of general distress, symptoms of anhedonia and low positive affect that are relatively unique to depression, and manifestations of somatic tension and arousal that are relatively specific to anxiety. Consistent with this model, our analyses of the MASQ items demonstrated that the same three symptom factors emerged in each of five samples.

Moreover, these factors converged well with the symptom groups hypothesized in the model. As predicted, one of the factors (General Distress) was nonspecific to depression and anxiety. It was defined by a broad range of symptomatology, including several items from each of the general distress scales. It is especially noteworthy that—consistent with prediction—items reflecting both anxious (e.g., "felt afraid," "felt nervous," "felt uneasy") and depressed (e.g., "felt depressed," "felt sad") affect were strong markers of this factor. This factor clearly taps variance that is common to depression and anxiety.

As predicted, each of the other symptom factors was more specifically related to one of the constructs. That is, the Somatic Anxiety factor was defined largely by somatic manifestations of anxiety. Note that all 16 of the items loading .50 or greater on this factor were somatic symptoms of anxiety (14 from Anxious Arousal, 2 from GD: Anxiety); in contrast, only two depression items ("felt slowed down," "thought about death, suicide") were markers of this dimension. Conversely, the specific depression factor was defined by positive emotionality items on its high end, and by various symptoms of depression (e.g., "felt nothing was enjoyable," "felt hopeless," "nothing was interesting or fun," "felt depressed") on the other. The specificity of this dimension was clearly demonstrated: none of the anxiety symptoms loaded significantly on it.

However, although the factor analytic data strongly supported the broad outlines of the tripartite model, many items showed factor loading patterns that differed significantly from our theoretical predictions. In this regard, the most striking finding was that several somatic symptoms that were predicted to be markers of General Distress actually were clear markers of the specific anxiety factor. These results strongly suggest that our con-

ceptualization of the specific anxiety symptom group overemphasized the importance of perceived autonomic hyperarousal as the centrally defining feature; in actuality, the specific factor that emerged was defined by a broader range of somatic symptoms, including several that do not clearly reflect autonomic hyperarousal (e.g., nausea, diarrhea).

Thus, our data simultaneously demonstrate both (a) broad support for the tripartite model and (b) the need for further refinements and modifications to it. Moreover, they indicate that although most of the MASQ items were put in the most appropriate scales, some were placed incorrectly. This, in turn, suggests the need for further refinements of the MASQ scales. We have, in fact, already conducted some exploratory revisions. For instance, we created an expanded Anxious Arousal scale by adding the five somatic GD: Anxiety symptoms that were markers of the Somatic Anxiety factor, and an expanded Anhedonic Depression scale by adding the six GD: Depression symptoms with significant secondary loadings on the specific depression factor (see Table 6). Preliminary analyses, however, indicated that these augmented scales did not show significantly better convergent and discriminant validity than the originals. Nevertheless, further examination of this issue—together with further conceptual refinements in the tripartite structure itself—is an important task for future research.

Replicability of Symptom Structure

Our findings also have important implications that are unrelated to the tripartite model. Most notably, we have demonstrated that the basic symptom structure in this domain (at least as it is operationalized in the 90 MASQ items) is highly convergent across college student, normal adult, and psychiatric patient samples. Specifically, our data show that extremely similar one-, two-, and three-factor structures can be identified in diverse samples. After three factors the individual solutions diverged sharply, so that no additional factors could be consistently identified in every data set. Thus, the crucial finding of substantial replicability was obtained at the basic factor level.

This replicability obviously increases one's confidence in the tripartite model. More fundamentally, however, it suggests that the basic symptom structure in this domain is itself robust across different populations. Much of the research in this area has been based on patient data, but countless studies of depression and anxiety have used college student samples. It is reassuring, therefore, to have clear evidence that these different populations may yield substantially similar results, at least in terms of structural analyses. In other words, on the basis of our results, it appears that basic structural analyses conducted with college students will generalize reasonably well to adult and patient samples. Conversely, structural analyses involving clinical patients can be expected to replicate in nonclinical samples. Clearly, our results themselves require replication using other measures and different samples; nevertheless, they provide preliminary evidence of an underlying coherence in symptom structure across different populations.

Limitations of the Study

We must note two limitations of our study. First, our structural analyses demonstrated an impressive level of convergence across five samples, but they were confined to a single set of self-rated symptoms. Although these 90 items appear to assess this domain more comprehensively than many existing instruments, they may not cover it completely or optimally. It is certainly possible, for instance, that certain types of symptoms are underrepresented relative to others. Thus, it is important that the current results be replicated using other symptom measures.

Second, our analyses included only one clinical sample. Moreover, this sample—composed primarily of male patients with substance use disorders (Watson et al., 1995)—is less than optimal for a study involving structural analyses of anxious and depressive symptomatology. It is possible that other patient groups would show somewhat different results, and that they might not converge as well with the student and adult samples. Accordingly, our results require replication using other patient groups.

Conclusion

We hope that our findings stimulate further investigation of the issues addressed in this article. Specifically, we hope to have encouraged further research into (a) the tripartite model of depression and anxiety and (b) the replicability of symptom structure across different populations. Despite the limitations we have noted, the clarity and consistency of our data suggest that these topics warrant further study.

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Received January 25, 1993
Revision received June 6, 1994
Accepted June 6, 1994 ■