



BRIEF REPORT

Discriminating between Problems in Living: An Examination of Measures of Depression, Loneliness, Shyness, and Social Anxiety

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The relationships between depression, loneliness, shyness, and social anxiety were examined in a self-report questionnaire study. Standard measures of these constructs were obtained from 302 undergraduates. Confirmatory and exploratory factor analyses were conducted to test several different models of these measures. The results indicated that: (1) the shyness and social anxiety scales measured the same construct, (2) the resulting three measures (depression, loneliness, shyness/social anxiety) are moderately interrelated, and (3) several items in the standard scales load too highly on one or more unpredicted factors. The importance of obtaining factorially pure measures of these problems in living, and possible modifications to the scales, are discussed.

In recent years the mental health community has become increasingly aware of and concerned about problems of nonclinical populations. Estimates of the incidence of such problems as depression, loneliness, and shyness in the general U.S. population may vary, but they are uniformly high. For example, approximately 15% of the population shows significant signs of depression at any given time (Secunda, 1973); 26% reports being lonely within the past few weeks (Bradburn, 1969), and about 40% of high school and college students claim to be dispositionally shy (Zimbardo, Pilkonis, & Norwood, 1974). Although the psychological costs of such problems are borne mainly by the individual and his or her family and acquaintances, it is clear that society as a whole also pays a tremendous price in terms of lost work days, inefficient interpersonal communications (and its many organizational consequences), dissolutions of families, and other interrelated effects of these individuals' problems.

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Increased interest in these problems has been accompanied by a gradual eroding of once solid boundaries between the areas of cognitive, social, personality, and clinical psychology. This has fostered exciting new approaches to the study of these traditionally clinical problems. Examples include Kuiper's social-cognitive approach to depression (e.g., Kuiper, Olinger, & MacDonald, 1982), Horowitz's prototype approach to loneliness and depression (e.g., Horowitz, French, & Anderson, 1982), Zimbardo's social skills and attributional approaches to shyness (Brodth & Zimbardo, 1981; Zimbardo, 1977) and various attributional approaches to depression, loneliness, and shyness (e.g., Anderson, 1983; Anderson & Arnoult, 1985; Anderson, Horowitz, & French, 1983; Anderson, Jennings, & Arnoult, 1988; Seligman *et al.*, 1979). The results of these and related studies have been successfully incorporated into new therapies and have helped to explain the efficacy of more traditional therapies as well as to suggest improvements in them (see e.g., Antaki & Brewin, 1982; Bandura, 1977; Beck *et al.*, 1979; Frieze, Bar-Tal, & Carroll, 1979).

One impediment to continued progress in understanding and treating these widespread problems is confusion about the separability and measurability of the constructs. A large number of studies suggest that the problems of loneliness, depression, shyness, and social anxiety are at least highly interrelated, if not essentially the same (e.g., Anderson, Horowitz, & French, 1983; Anderson & Arnoult, 1985; Russell, Peplau, & Cutrona, 1980; Russell, Peplau, & Ferguson, 1978). Results of a few studies suggest, however, that two of the problems, loneliness and depression, are somewhat different even though highly correlated (Anderson, Horowitz, & French, 1983; Horowitz, French, & Anderson, 1982; Weeks *et al.*, 1980).

However, the distinction between two of the problems—shyness and social anxiety—is particularly problematic. Recent conceptual analyses point out that shyness has sometimes referred to a form of social anxiety; at other times social anxiety has been defined as one aspect of shyness (specifically, the subjective experience of apprehension and nervousness in social situations). Several other definitions and distinctions have also been made (see Leary, 1983, and Daly and McCroskey, 1984, for excellent treatments of these issues). Although the conceptual distinctions between these various problems in living seem clear and meaningful, the empirical distinctiveness of depression, loneliness, shyness, and social anxiety is still very much an open question.

A conclusive construct validation study of these four concepts would require a number of different measures of each construct as well as measures of other constructs with varying theoretical relations to the four target constructs, as well as a large and varied sample of subjects. Practically, several studies of more modest scope is a more reasonable

way to proceed. This article reports an initial attack on the problem. Briefly, subjects completed a measure of each construct. A series of confirmatory and exploratory factor analyses examined the interrelatedness and distinctiveness of the measures. In a sense, our study is best viewed as a measure validation study rather than as a construct validation study, because we examined only one measure of each construct. Thus our results speak most directly to issues concerning the particular measures we examined. Obviously, the results also address (less strongly) the construct validity issue.

METHOD

Subjects. A total of 302 undergraduates from Rice University and the University of Houston completed a questionnaire packet containing the scales for either \$3 or credit toward a psychology course requirement. Each subject received a written explanation of the study after completing the questionnaire packet.

Procedure. Subjects completed a questionnaire packet containing the short form of the Beck Depression Inventory (BDI; Beck & Beck, 1972), the revised UCLA Loneliness Scale (LS; Russell, Peplau, & Cutrona, 1980), the Shyness Scale (SS; Cheek & Buss, 1981), the Social Anxiety Scale (SAS; Fenigstein, Scheier, & Buss, 1975), and three other shyness items. (Two of these were recently added to the SS, personal communication from Jonathan Cheek, 1982; the third was a 6-point self-descriptive shyness item from Zimbardo's (1977) shyness inventory. In addition, the packet contained several measures of attributional style that are not relevant to the present study (see Anderson & Arnoult, 1985, for the attributional style results). Note that the SAS and SS have one item in common. We arbitrarily assigned it to SAS.

RESULTS AND DISCUSSION

CONFIRMATORY ANALYSES

Confirmatory maximum likelihood factor analysis was used to examine the degree to which several different factor models could explain the obtained item correlation matrix (Bentler, 1980; Joreskog, 1969, 1978; Joreskog & Sorbom, 1981). The common factor analysis model (e.g., Thurstone, 1947) was used.

We examined results from ten different models. We first examined a null model, which holds that there were no common factors underlying

the 50 items. The primary purpose of this was to allow calculation of the *rho* index (Bentler & Bonnett, 1980) and the PFI (James, Mulaik, & Brett, 1982) measures of model fit for the nine models of interest. Both of these fit measures can range from 0 to 1.0, with larger numbers indicating a better fit of the factor model to the data. They differ primarily in the PFI stresses model parsimony, penalizing the user for adding free parameters that do not appreciably increase model fit. We also examined a third measure of fit, the root mean square residual (RMSR). This can be interpreted as a measure of the average residual correlation resulting from subtracting the reproduced correlation matrix (generated from the factor solution) from the actual correlation matrix. RMSR should be compared with the size of the values in the actual matrix of correlations for interpretation (i.e., small values, relative to the size of the correlations, would indicate good model fit). The results of these analyses are summarized in Table 1.

Inspection of RMSR for the null model indicated relatively poor fit for this model: the value of the RMSR (.238) was quite high relative to the absolute values of the actual correlations, which ranged from .001 to .748, with median = 0.186, mean = 0.207, and *SD* = 0.126. This low fit is consistent with our prior expectations that the items do in fact measure one or more common factors.

Next, we examined a general one factor model to see if all the items measure the same construct. Both the *rho* and the PFI fits were extremely poor; the RMSR also indicated that the fit was mediocre at best.

TABLE 1
Results of Confirmatory Factor Analyses

#	MODEL NAME	CHI-SQUARE	df	FIT INDICES		
				<i>rho</i> ^a	RMSR ^b	PFI ^c
0	Null model	6821.45	1225		0.24	
1	1-Factor	3715.02	1175	0.53	0.10	0.44
2	4-Factor orthogonal	2797.45	1174	0.70	0.16	0.56
3	4-Factor oblique	2395.29	1169	0.77	0.07	0.62
4	3-Factor orthogonal	2561.54	1175	0.74	0.14	0.60
5	3-Factor oblique	2418.17	1172	0.77	0.07	0.62
5	4-Factor + method, orthogonal	2666.46	1161	0.72	0.16	0.58
7	4-Factor + method, oblique	2253.52	1151	0.79	0.07	0.63
8	3-Factor + method, orthogonal	2430.95	1162	0.76	0.14	0.61
9	3-Factor + method, oblique	2278.39	1156	0.79	0.07	0.63

^a Comparison of the chi-square/df ratio for each model with the chi-square/df ratio for the null model.

^b Root mean square residual.

^c Parsimonious Fit Index.

The next two models represented the *a priori* four factor model (i.e., shyness, social anxiety, loneliness, and depression). One version forced the factors to be orthogonal (uncorrelated), whereas the other provided for oblique (correlated) factors. Although considerably better than the fits of the null and one factor models, the fit indices of the four factor models were somewhat low, especially the orthogonal version. Indeed, its RMSR value was actually worse than the one factor model's, though the corresponding *rho* and PFI fits were much better. Inspection of the factor correlation matrix revealed a pattern of moderate intercorrelation among the four factors, with one extremely high factor correlation ($r = 0.92$) between the social anxiety and shyness scales.

These results indicated that: (1) the grouping of items into the four scales did not satisfactorily account for the item correlations, (2) the four factors formed by this grouping were clearly nonorthogonal, and (3) the distinction between the social anxiety and shyness constructs was artificial (i.e., they measure the same thing).

In view of the very high correlation between the social anxiety and shyness factors, an alternative to the *a priori* 4-factor model was developed that combined these two constructs into a single factor (shyness/social anxiety). Two 3-factor models (orthogonal and oblique) were tested next. If the 4-factor models are more accurate representations of the data, then the 3-factor models should yield considerably poorer fit indices. The 3-factor models actually yielded several slight improvements over the 4-factor models. Overall, the assessment of these models was similar to that for the *a priori* models: (1) the oblique factor solution seemed to be the most reasonable, and (2) the moderate degree of overall model fit suggested that further improvements in the factor model could still be sought. However, the fact that the best-fitting (oblique) 3- and 4-factor models were virtually identical across the various indices of fit indicates that the 3-factor model is superior to the 4-factor model, because the elimination of the distinction between social anxiety and shyness had no impact on the ability of the model to fit the data. (Note that because we did not have *a priori* reasons to test the 3-factor model, it is important that these findings be replicated.)

We attempted to improve the factor model fits by adding a method factor to account for unwanted variation produced by some items being worded in a negative fashion and reverse scored (e.g., see Harvey, Billings, & Nilan, 1985). Four such models were examined (3- and 4-factor models with orthogonal and oblique criteria). Briefly, there was no evidence of a method factor.

No further modifications to the initial factor solution to improve its fit could be derived by rational means; however, we judged the fit of even the best model (3-factor, oblique) to be inadequate. Although statisti-

cal significance tests or other such interpretive aids are not currently available for *rho*, PFI, and RMSR, rough "rules of thumb" are commonly used. For *rho*, values less than approximately 0.90 are typically viewed as inadequate; the 3-factor oblique *rho* was .77. Therefore, an exploratory factor analysis was used in an attempt to discover clues as to why the model fit only moderately well. First, it could be the case that an alternative grouping of test items into constructs other than those of the test developers (i.e., a different factor structure) is more appropriate. Second, improperly classified test items (i.e., items with relationships with constructs other than the *a priori* one) might be discovered. Third, undesirably complex items (i.e., items with loadings on multiple factors) might be identified.

EXPLORATORY ANALYSES

The 50 variable correlation matrix was analyzed using principal axes common factor analysis. Squared multiple correlations (SMCs) were used as the estimates of communality for the items. Examination of eigenvalues strongly suggested a 3-factor solution.

The 3-factor exploratory factor pattern was striking in terms of the clarity of the solution. Three strong factors emerged, which were characterized by both high loadings on the factors and a relative infrequency of items loading significantly on more than one factor. Two of the factors appeared as predicted on the basis of the original scale composition. Factor 1 was the loneliness factor, with nontrivial loadings by all of the LS items; factor 3 was the depression factor, consisting of all the BDI items. Contrary to the initial conceptualization, factor 2 combined the original social anxiety and shyness items into one grouping.

The main purpose of the exploratory analysis was to identify potential causes of the modest fit for the confirmatory models. There were several items that had nontrivial loadings on a factor other than the *a priori* one. The most serious of these cases were items LS-4 ("I do not feel alone") and LS-9 ("I am an outgoing person"), which had stronger loadings on the depression and the shyness/social anxiety factors, respectively, than on the predicted loneliness factor. In order to evaluate objectively the relative magnitudes of nonpredicted factor loadings, an index was developed, computed by dividing the squared factor loading on the predicted factor by the highest squared nonpredicted factor loading. Inspection of the distribution of the values of the loading index suggested that items with values less than 10 were probably undesirable items, in the sense of having insufficiently high loadings on the predicted factor (relative to the highest nonpredicted loading). Based on this logic, the following items were seen to be candidates for deletion from their *a priori* scales:

BDI-7 (self-harm), BDI-10 (Self-image change), LS-4 (feeling alone), LS-9 (outgoing), LS-11 (feeling left out), LS-17 (withdrawn), SS-4 (asking for information), and SS-10 (eye contact).

In order to evaluate the practical effect of deleting the suspect items, summated scale scores were computed both with and without the undesirable items. The correlations between these scales, as well as coefficient alpha estimates of scale reliability, are reported in Table 2.

Coefficient alpha internal consistency reliability estimates all reached acceptable levels. Note also that the modified scale scores were extremely similar to the total scale scores (all $r_s = 0.99$). In addition, the scales exhibited moderate positive intercorrelations. As a strictly empirical matter, these data could be interpreted to suggest that it makes little difference whether or not the undesirable items identified in the factor analysis are included in the final summated scale scores. However, elimination of the undesired items did lead to reduced interscale correlations, as can be seen in Table 2. For example, the loneliness-depression correlation dropped from 0.42 to 0.35. Indeed, both the loneliness-depression and the loneliness-shyness correlations from the modified scales were significantly lower than the corresponding full scale correlations, $t_s(299) > 10.99$, $p_s < .001$. Thus the advantage of the modified scales is both greater conceptual and empirical distinctiveness between the summated scores for depression, loneliness, and shyness/social anxiety.

TABLE 2
Correlations of Summated Scale Scores

	SCALE					
	LONE-T ^a	SSAS-T ^b	DEPR-T ^c	LONE-M ^d	SSAS-M ^e	DEPR-M ^f
Lone-T	0.91 ^g					
SSAS-T	0.49	0.89				
Depr-T	0.42	0.30	0.79			
Lone-M	0.99	0.42	0.37	0.90		
SSAS-M	0.48	0.99	0.30	0.41	0.90	
Depr-M	0.39	0.29	0.99	0.35	0.29	0.78

^aLoneliness scale, using total number of items.

^bShyness/social anxiety scale, using total number of items.

^cDepression scale, using total number of items.

^dModified loneliness scale.

^eModified shyness/social anxiety scale.

^fModified depression scale.

^gDiagonal entries are coefficient alpha estimates of scale reliability.

CONCLUSIONS

The above results suggest several conclusions. First, these shyness and social anxiety scales could be combined into a single scale. This does not mean that, at a conceptual level, there is no distinction between the shyness and social anxiety constructs. Rather, at the measurement level, it suggests that the scales commonly used to assess shyness and social anxiety may be combined for most practical purposes. It is the task of future research to determine the generality of this conclusion in other populations of subjects and with other measures of shyness and social anxiety. Second, the three remaining constructs do not appear to be orthogonal, as both exploratory and confirmatory analyses indicated that these measures are positively intercorrelated. Third, both the confirmatory factor analyses and the subsequent exploratory analysis suggest that the modest fit of the 3-factor oblique model be attributed to the fact that several items had loadings on both the predicted as well as on an additional unpredicted factor. It is the task of future research to examine the viability of this hypothesis in new samples of subjects.

Of course, more research on these scales and on others designed to assess these problems in living is needed before drawing firm conclusions. However, our results strongly suggest that the 3-factor conceptualization (depression, loneliness, and shyness/social anxiety) uncovered in this study may be more meaningful than the existing 4-factor one. This is certainly true for the specific measures used in this study.

Finally, researchers studying depression, loneliness, and shyness (or social anxiety) would probably be wise to use the modified scales suggested by the exploratory factor analysis. By dropping the contaminated items, the researcher will obtain measures of depression, loneliness, or shyness (social anxiety) that are as factorially pure as possible. This is especially important when testing models or examining theories of differences between these problems in living.

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