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ABSTRACT

People's beliefs about the origins of their health, sometimes referred to as health locus of control, have been shown to influence a variety of important behaviors, including the propensity to engage in effective health maintenance activities, and the willingness to seek and follow medical advice. The purpose of the present study was to explore the nature, i.e., the structure of the health locus of control beliefs, using the Multidimensional Health Locus of Control Scales. The sample size (609 college students) was sufficiently large to allow the use of confirmatory maximum-likelihood factor analyses. The robustness of construct validity findings across various matrices of inter-item association was also investigated. Results suggest that the development of larger and more diverse item pools measuring more constructs might be useful in further exploring the structure of health locus of control beliefs. Such item pools would allow the identification of more factors and better model fit than the model supported in this study, one with three factors (six items per factor) correlated with each other. An appendix lists the 18 scale items. (Contains 38 references and 6 tables.) (Author/SLD)

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PERCEPTIONS OF CONTROL OVER HEALTH:

A CONFIRMATORY LISREL CONSTRUCT VALIDITY STUDY

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PERCEPTIONS OF CONTROL OVER HEALTH:

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Abstract

People's beliefs about the origins of their health, sometimes referred to as health locus of control, have been shown to influence a variety of important behaviors, including the propensity to engage in effective health maintenance activities, and the willingness to seek and follow medical advise. The purpose of the present study was to explore the nature, i.e., the structure, of the health locus of control beliefs, using the Multidimensional Health Locus of Control Scales. The sample size (*n* = 609) was sufficiently large to allow the use of confirmatory maximum-likelihood factor analyses. The robustness of construct validity findings across various matrices of interitem association was also investigated.

People's beliefs about the origins of their health, sometimes referred to as health locus of control, have been shown to influence a variety of important behaviors, including the propensity to engage in effective health maintenance activities, and the willingness to seek and follow medical advice (Riggs & Noland, 1984, p. 431). Before being conceptualized more narrowly, "locus of control" first emerged as a generalized construct referring to individuals' beliefs about the origins of their global situations (Rotter, 1968). According to social learning theory, persons who believe that they control their own destinies, i.e., Internals, behave in predictable ways in comparison with their External counterparts, i.e., persons who believe that chance or powerful others determine the outcomes in their lives.

But one consensus that has emerged from this literature is the view that prediction of generalized behavior requires general measures of expectancy (i.e., predicting general approaches to life requires perceptions of control over general life events), while more specific predictions require more specific measures of locus of control (i.e., predicting specific behaviors, such as health-related behaviors, requires perceptions of control over health-related events rather than general feelings or perceptions of control) (Lefcourt, 1981, p. 386). As B. Wallston, Wallston, Kaplan and Maides (1976, p. 584) argued, "The more specific the instrument, the better the prediction of a particular behavior in a particular situation." In an empirical study confirming these theoretical expectations, Saltzer (1982, pp. 626-627) used both general and specific locus of control measures and reported that the outcome-specific measures predicted experimental outcomes while locus of control measures that did not deal with beliefs specifically about control of weight "would not have led to the predicted findings."

Strickland (1973) reviewed 11 studies investigating linkages between health locus of control beliefs and outcomes and reported that there are positive relationships between a more Internal locus of control and physical health or well being. In one of the first studies employing locus of control as a predictor variable, Seeman and Evans (1962) found that hospitalized tuberculosis patients who were more Internal knew more about their conditions, questioned health professionals more for information, and expressed less satisfaction about the information they were getting regarding their conditions. Similarly, in a study with epileptics, DeVellis, DeVellis, Wallston and Wallston (1980) found that information-seeking behaviors were associated in theoretically expected ways with locus of control scores.

K. Wallston, Wallston and DeVellis (1978) developed what is probably the most frequently used measure of beliefs about health locus of control, i.e., the Multidimensional Health Locus of Control (MHLC) Scales. As Russell and Ludenia (1983, pp. 453-454) noted, "The MHLC Scales have been employed in a substantial number of studies that investigated various health conditions and health-related behaviors with a wide range of populations." The MHLC Scales are purported by the measure's authors to tap three dimensions, using six items per dimension: (a) *Internal*--belief by individuals that their own behaviors determine health; (b) *Chance*--belief by individuals that health is determined by chance factors; and (c) *Powerful Others*--belief that the behaviors of powerful others, such as doctors and nurses, determines health.

The purpose of the present study was to explore the nature, i.e., the structure, of the health locus of control beliefs, using the MHLC Scales. Several researchers have examined the measurement integrity of the MHLC Scales, or of revisions of the scales. For example, the internal consistency reliability of the Scales has been investigated (Marshall, Collins & Crooks, 1990; Thompson, Butcher & Berenson, 1987). The construct validity of the scales has also been investigated using various factor analytic methods, including principal components analysis (Daniel, LeBert & Haydel, 1993; Marshall et al., 1990; Thompson, Butcher & Berenson, 1987), second-order exploratory factor analysis (Thompson, Webber & Berenson, 1990), and confirmatory first-order factor analysis (Thompson, Webber & Berenson, 1987, 1988).

But to date models have not been fit to data and then cross-validated with large, independent samples. Furthermore, virtually all previous analyses with this measure focused on factors extracted from correlation matrices. As Cudeck (1989) has emphasized, the testing of covariance structures extrapolated from correlation matrices under some circumstances may modify the model being analyzed, may produce incorrect test statistics and indices of fit, and may yield incorrect standard errors.

Illustrative Previous Structure Research

Work with Rotter's *general* locus of control measure (as against *health* more specifically) suggests that general locus of control is factorially complex and not unidimensional, although Rotter did not himself attempt to delineate a multidimensional model of his construct. Marsh and Richards (1987) reviewed 20 published studies in which exploratory factor analytic methods were employed with Rotter's measure, and then tested several models using confirmatory methods. They found empirical support for the fit of a model involving as many as six factors: General Luck, Political Control, Success via Personal Initiative, Interpersonal Control, Academic Situations, and Occupational Situations.

Related previous inquiry more specifically investigating the nature of *health* locus of control beliefs in particular has met with less success in delineating the structure underlying MHLC responses. For example, Coehlo (1985) investigated MHLC structure in a study involving 146 adult chronic smokers. He found that scores on MHLC Scales had limited reliability and that the expected three-factor structure was not appropriate for his data.

Buckelew, Shutty, Hewett, Landon, Morrow and Frank (1990) conducted an exploratory factor analysis of MHLC data from 160 adult patients receiving an intervention for pain rehabilitation. The researchers identified three factors across a series of analyses in which they used holdout samples to explore result replicability across different combinations of their subjects. Unlike many previous researchers, however, they isolated *correlated* factors based on a promax factor rotation.

Robinson-Whelen and Storandt (1992) investigated the structure underlying the MHLC Scales using data from 368 adults, including 171 diabetics. They employed confirmatory maximum-likelihood factor analysis in their study, as we did in the present study, and they found that "LISREL analysis suggested an adequate fit but one that could be improved with some modifications" (p. 211) of the structural model posited by the authors of the MHLC Scales.

Methodological Premises

We held the view that our study would be improved by consciously grounding our analyses on explicit analytic premises. We selected three such premises. First, we adopted a premise acknowledging the prominent role that factor analysis can play in efforts to establish construct validity. As Nunnally (1978, p. 111) noted, historically, "construct validity has been spoken of as [both] 'trait validity' and 'factorial validity.'" Similarly, Gorsuch (1983, p. 350) noted that, "A prime use of factor analysis has been in the development of both the operational constructs for an area and the operational representatives for the theoretical constructs." In short, "factor analysis is intimately involved with questions of validity.... Factor analysis is at the heart of the measurement of psychological constructs" (Nunnally, 1978, pp. 112-113).

Second, we adopted a premise emphasizing the importance of the replicability of results across analytic methods. As Gorsuch (1983, p. 201) observed, "Factors that will appear under a wide variety of conditions are obviously more desirable than factors that appear only under specialized conditions", e.g., only when certain samples or certain factor extraction methods are used. Similarly, Kerlinger (1986, p. 593) observed that replication of factors across studies serves as "compelling evidence of the empirical validity of the original results." Consequently, we replicated all factor analyses by extracting factors for each of our models from four different matrices of association: (a) the variance/covariance matrix involving the 18 MHLC items--this is the matrix conventionally employed in much covariance structure analysis work; (b) the correlation matrix--this is the matrix used in most previous exploratory factor analytic work; (c) a polychoric correlation matrix--the interitem correlation matrix calculated in this manner does not presume intervally scaled-data; and (d) a correlation matrix adjusted for so-called "censored" data associated with the skewness frequently encountered in attitude measurement.

Third, we adopted a premise that more parsimonious models should be preferred over less parsimonious models. In general, it seems reasonable to consider the parsimony of the models that we are testing (Mulaik, James, van Alstine, Bennett, Lind & Stilwell, 1989). When we "free" a parameter in a confirmatory analysis, we get an exact fit to the data for this estimate. So fit is partially a function of how many parameters we free. Our most realistic estimates of fit arise when try to fit the parameters we want to emphasize from one study to the data from another study, so that fit is less artifactual. Cross-validations in which more model parameters are fixed have more degrees of freedom, meaning there are more ways in which the models are potentially falsifiable, and so represent more rigorous tests of our conceptions of latent constructs (Mulaik, 1987, 1988). Thus, in the present study we fit factor loadings from a previous study (Thompson, Webber & Berenson, 1992) from four factor models for each of the four matrices of association from which factors were extracted in the present study.

Method

Subjects

It is increasingly being recognized that covariance structure analyses require relatively large samples (Baldwin, 1989; Bentler, 1994), so a large sample was employed in the present study. The subjects were 609 students enrolled at a large university. The sample included slightly more women (53.5%) than men. The students were predominantly (92.2%) not members of an ethnic minority group. Most of the students (80.9%) were undergraduates. One hundred sixty-six (27.3%) of the subjects were married at the time of the study.

Analysis

It was decided to employ confirmatory methods in these investigations, because previous studies (Marshall, Collins & Crooks, 1990; Thompson, Butcher & Berenson, 1987) suggest that the MHLC scales may not yield data with quite the reliability one might prefer, and confirmatory methods provide strategies for both empirically estimating measurement error and testing the invariance of various aspects of complex models across samples and item pools. Confirmatory maximum-likelihood model tests were conducted with the LISREL 7.16 program described by Jöreskog and Sörbom/SPSS (1989).

The rival models tested in a confirmatory manner were derived from theory and previous related empirical work, though most previous studies (a) extracted structure from correlation matrices and (b) used exploratory methods with rotation to the varimax criterion. In all analyses in the present study factor variances were constrained to equal one so that the factors were statistically identified.

Model A. Most of the previous studies (B. Wallston et al., 1976; K. Wallston et al., 1978) using the MHLC scales have tested a model presuming three uncorrelated factors, i.e., Internal, Chance, and Powerful Others, with each factor being defined univocally by six items. This is the model operationalized in the scoring system recommended by the authors of the MHLC Scales.

Model B. Most researchers define constructs as being sufficiently discrete to be worth distinguishing, and for the factors qua factors to be invariant. But generally we do not expect factor variances or covariances to be invariant, since these parameters can change with sampling and restriction of range effects (Mulaik, 1972). In fact, previous studies (Larde & Clopton, 1983; Russell & Ludenia, 1983; Thompson, Butcher & Berenson, 1987; K. Wallston et al., 1978) examining bivariate correlations among scale scores, created by summing six item responses per scale, indicate that the correlations among raw scores are variable, supporting a view that factor covariances also might not be expected to be invariant. This view suggests the definition of a model in which the three factors (six items per factor) are posited to be correlated with each other.

Model C. Previous research (cf. Thompson, Webber & Berenson, 1992) has indicated that the Chance and Powerful Others scales may yield highly correlated scores. This is theoretically sensible, since both these dimensions are "external" in the original theory developed by Rotter (1968). Model "C" presumes a fourth factor consisting of 12 items (i.e., the six Chance and the six Powerful Others items). However, this factor was constrained to be uncorrelated with the other factors, and thus in a sense defines a covariate.

Model D. In previous research with an different sample, a reasonable fit to data has been found for a model (see Thompson, Webber & Berenson, 1992) positing a "Personal Initiative" factor consisting of nine items, a "Luck" factor consisting of seven items (the six Chance items and item number 8), and a factor consisting of the six Powerful Others items.

Results

Tables 1 through 4 provide the fit statistics for each of the models across extraction of factors from each of the four matrices of association. A variety of fit statistics are presented in the tables, including the χ^2 for each model, the degrees of freedom for each model, the noncentrality parameter for each model (i.e., χ^2 - df), and the ratio of the noncentrality parameter to the degrees of freedom for the model. Better fitting models have lower ratios computed as the noncentrality parameter divided by degrees of freedom.

INSERT TABLES 1 THROUGH 4 ABOUT HERE.

The tables also present the LISREL goodness-of-fit index (GFI) for each model, as well as the Bentler (1990) comparative fit index (CFI). The CFI is computed using the χ^2 and the degrees of freedom for a baseline null-model presuming that no factors underlie the data. Better GFI and CFI values approach one.

Finally, the tables present parsimony ratios (Mulaik et al., 1989) associated with the GFI and the CFI statistics. These take into account how many parameters were estimated in a given analysis. More parsimonious models estimate fewer parameters and therefore have larger parsimony ratios. Multiplying parsimony ratios by their respective fit indices yields weighted fit statistics that take model parsimony into account.

Across the four sets of analyses presented in Tables 1 through 4, model "C" (positing four factors including a covariate factor) tended to have the best fit statistics. The exception was in the analysis of factors extracted from a correlation matrix presuming that the data were "censored" by skewness. As reported in Table 4, model "B" (positing three correlated factors) provided a slightly better fit in this last analysis. However, models "B" and "C" generally both provided a reasonable fit to the data.

The models designated with asterisks in these tables involved fitting the actual factor loadings from a previous study (Thompson, Webber & Berenson, 1992) to the data in the present study. The tabled results indicate that the specific loadings did not generalize as well as one might hope across samples. However, the present study involved adults, while the previous study involved children, so the result is not as discouraging as might otherwise be the case. For these analysis model "B" tended to yield somewhat better fit statistics, perhaps because this model is somewhat more parsimonious than model "C".

Space precludes presentation of all 28 sets of LISREL confirmatory maximum-likelihood factor analytic results. Tables 5 and 6 present the results from better fitting models extracted from the conventional product-moment correlation matrix. These results are illustrative of the coefficients derived elsewhere; the complete set of 24 tables is available from the authors.

INSERT TABLES 5 AND 6 ABOUT HERE.

Discussion

As Neale and Liebert (1986, p. 290) emphasized, it is important to recognize that

> No one study, however shrewdly designed and carefully executed, can provide convincing support for a causal hypothesis or theoretical statement in the social sciences... How, then, does social science theory advance through research? The answer is, by collecting a diverse body of evidence about

any major theoretical proposition.

Positive features of the present study included the attempts to address such concerns by fitting parameters from a previous study (Thompson, Webber & Berenson, 1992) to the data in the present study, and by analyzing four different matrices of association.

Confirmatory methods were employed in the present study. Exploratory factor analysis yields indeterminate common factors, so even if methods could somehow create meaning or define constructs, certainly exploratory common factor analysis can not do so. As Mulaik (1987, p. 301) notes, "It is we who create meanings for things in deciding how they are to be used. Thus we should see the folly of supposing that exploratory factor analysis will teach us what intelligence is, or what personality is." Confirmatory analysis forces us to do the best job we can of creating the meaning of our constructs, presumably using available theory and previous empirical research. The latent variables we define then represent a more objective conception of our constructs.

A host of fit statistics can be consulted to help us evaluate the fit of our definitions to data. These statistics include the LISREL goodness-of-fit index (GFI), the parsimonious GFI (PGFI), the Bentler comparative fit index (CFI), and the parsimonious CFI (PCFI), among others.

With respect to the relative utility of GFI versus CFI indices, though they are grounded in different theory, they often yield comparable results (Mulaik et al., 1989). But GFI evaluates fit to both the variances and the covariances of the observed variables, while CFI evaluates fit to only the covariances among the observed variables. As researchers employ more observed variables, the ratio of the $\underline{v}$ diagonal entries in the covariance matrix to the ($\underline{v}$ * ($\underline{v}$ - 1) / 2) off-diagonal matrix entries decreases rapidly, so to some extent the two indices may tend to be more similar in these circumstances.

We derive three conclusions from our results. First, the results reported in Tables 1 through 6 seem to support a view that models "B" and "C" are both plausible. However, as indicated in Table 4, model "C" is least plausible when data skewness is taken into account by computing the correlation coefficients from which the factors are extracted using statistical theory presuming the data were statistically "censored". Thus, somewhat more confidence might be vested in model "B". Model "B" would also be preferred, all things being equal, because the model presumes one less factor and is therefore more parsimonious.

It is noteworthy that model "A" was a less successful fit to the data. Model "A" is the model most commonly assumed by previous researchers who have employed exploratory factor analytic methods with scores from this measure. The results suggest that other analyses may be more suitable for these constructs.

Second, as reported in Tables 1 through 4, it is noteworthy that the particular factor parameters derived from a previous study with children did not particularly well fit the data from adults. The basic structure underlying perceptions of both groups was similar, insofar as models "B" and "C" provide the better fit to data in both groups. However, the *exact* factor parameters themselves do not generalize exceptionally well across samples. So the factors appear invariant over age groups, but the particular composition of the factors is less invariant to change.

Third, the study also suggests a methodological conclusion. For these factor analytic results, as reported in Tables 1 through 4, most of the results were reasonably comparable across the four matrices of association that were considered. However, greater differences in results were associated with the fourth matrix of associations, which took into consideration the skewness of the responses. Thus, concerns about analyzing variance-covariance matrices as opposed to other matrices may not be as troublesome as they are thought to be by some (Cudeck, 1989), at least if these factor analytic results are any indication.

The present results do, of course, also reflect the limits of the literature in this area. Notwithstanding the fact that "during the last two decades locus of control has been one of the most widely studied of personality constructs" (Marsh & Richards, 1987, pp. 39-40), we are still in the infancy of elaborating relevant theory and developing measures of theory. As Hendrick and Hendrick (1986, p. 393) have noted, "theory building and construct measurement are joint bootstrap operations." The results of the present study suggest that the development of larger and more diverse item pools measuring more constructs might be useful in further exploring the structure of health locus of control beliefs. Such item pools would allow the identification of more factors, and the exploration of more complex, hierarchical factor structures. Structures with more factors, isolated with more items, might yield even more favorable results as regards model fit.

References

Baldwin, B. (1989). A primer in the use and interpretation of structural equation models. Measurement and Evaluation in Counseling and Development, 22, 100-112.

Bentler, P.M. (1990). Comparative fit indices in structural models. Psychological Bulletin, 107, 238-246.

Bentler, P.M. (1994). On the quality of test statistics in covariance structure analysis: Caveat emptor. In C.R. Reynolds (Ed.), Advances in cognitive assessment: An multidisciplinary perspective (pp. 237-267). New York: Plenum.

Buckelew, S.P., Shutty, M.S., Hewett, J., Landon, T., Morrow, K., & Frank, R.G. (1990). Health locus of control, gender differences and adjustment to persistent pain. Pain, 42, 287-294.

Coelho, R.J. (1985). A psychometric investigation of the Multidimensional Health Locus of Control Scales with cigarette smokers. Journal of Clinical Psychology, 41(3), 372-376.

Cudeck, R. (1989). The analysis of correlation matrices using covariance structure models. Psychological Bulletin, 105, 317-327.

Daniel, L.G., LeBert, L., & Haydel, J. (1993, November). Health locus of control and school achievement in middle school students. Paper presented at the annual meeting of the Mid-South Educational Research Association, New Orleans.

DeVellis, R. F., DeVellis, B. M., Wallston, K. A., & Wallston, B. S. (1980, August). Epilepsy as an analogue of learned helplessness. Paper presented at the annual meeting of the

American Psychological Association, Washington, DC.

Gorsuch, R.L. (1983). Factor analysis (2nd ed.). Hillsdale, NJ: Erlbaum.

Hendrick, C., & Hendrick, C. (1986). A theory and method of love. Journal of Personality and Social Psychology, 50, 392-402.

Jöreskog, K.G., & Sörbom, D./SPSS. (1989). LISREL 7: A guide to the program and applications (2nd ed.). Chicago: SPSS.

Kerlinger, F.N. (1986). Foundations of behavioral research (3rd ed.). New York: Holt, Rinehart and Winston.

Larde, J., & Clopton, J. R. (1983). Generalized locus of control and health locus of control of surgical patients. Psychological Reports, 52, 599-602.

Lefcourt, H. M. (1981). Research with the locus of control construct: Volume 1 assessment methods. New York: Wiley.

Marsh, H.W., & Richards, G.E. (1987). The multidimensionality of the Rotter I-E scale and its higher-order structure: An application of confirmatory factor analysis. Multivariate Behavioral Research, 22, 39-69.

Marshall, G.N., Collins, B.E., & Crooks, V.C. (1990). A comparison of two multidimensional health locus of control instruments. Journal of Personality Assessment, 54, 181-190.

Mulaik, S.A. (1972). The foundations of factor analysis. New York: McGraw-Hill.

Mulaik, S.A. (1987). A brief history of the philosophical foundations of exploratory factor analysis. Multivariate Behavioral Research, 22, 267-305.

Mulaik, S.A. (1988). Confirmatory factor analysis. In R.B. Cattell

& J.R. Nesselroade (Eds.), Handbook of multivariate experimental psychology. New York: Plenum.

Mulaik, S.A., James, L.R., van Alstine, J., Bennett, N., Lind, S., & Stilwell, C.D. (1989). Evaluation of goodness-of-fit indices for structural equation models. Psychological Bulletin, 105, 430-445.

Neale, J.M., & Liebert, R.M. (1986). Science and behavior: An introduction to methods of research (3rd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Nunnally, J.C. (1978). Psychometric theory (2nd ed.). New York: McGraw-Hill.

Riggs, R. S., & Noland, M. P. (1984). Factors related to the health knowledge and health behavior of disadvantaged black youth. Journal of School Health, 54, 431-434.

Robinson-Whelen, S., & Storandt, M. (1992). Factorial structure of two health belief measures among older adults. Psychology and Aging, 7(2), 209-213.

Rotter, J. B. (1968). Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 80, 1-28.

Russell, S. F., & Ludenia, K. (1983). The psychometric properties of the Multidimensional Health Locus of Control Scales in an alcoholic population. Journal of Clinical Psychology, 39, 453-459.

Saltzer, E. B. (1982). The Weight Locus of Control (WLOC) Scale: A specific measure for obesity research. Journal of Personality Assessment, 46, 620-628.

Seeman, M., & Evans, J. W. (1962). Alienation and learning in a hospital setting. American Sociological Review, 27, 772-783.

Strickland, B. (1973, September). Locus of control: Where have we been and where are we going? Paper presented at the annual meeting of the American Psychological Association, Montreal.

Thompson, B., Butcher, A., & Berenson, G. (1987). Children's beliefs about sources of health: A reliability and validity study. Measurement and Evaluation in Guidance and Counseling, 20, 80-88.

Thompson, B., Webber, L., & Berenson, G. S. (1987). Factor structure of a children's health locus of control measure: A confirmatory maximum-likelihood analysis. Educational and Psychological Measurement, 47, 1071-1080.

Thompson, B., Webber, L., & Berenson, G.S. (1988). Validity of a children's health locus of control measure: A "Heart Smart" study. American Journal of Health Promotion, 3(2), 44-49.

Thompson, B., Webber, L., & Berenson, G.S. (1990, January). Validity of a measure of children's health locus of control: A second-order factor analysis. Paper presented at the annual meeting of the Southwest Educational Research Association, Austin, TX. (ERIC Document Reproduction Service No. ED 327 543)

Thompson, B., Webber, L., & Berenson, G.S. (1992, August). Measuring children's health locus of control beliefs. Paper presented at the annual meeting of the American Psychological Association, Washington, DC. (ERIC Document Reproduction Service No. ED 350 493)

Wallston, B. S., Wallston, K. A., Kaplan, G. D., & Maides, S. A.

(1976). Development and validation of the Health Locus of Control (HLC) Scale. Journal of Consulting and Clinical Psychology, 44, 580-585.

Wallston, K. A., Wallston, B. S., & DeVellis, R. (1978). Development of the Multidimensional Health Locus of Control (MHLC) Scales. Health Education Monographs, 6(2), 160-170.

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Table 1
Fit Statistics for the Four Models
Involving Factors Extracted from the Variance/Covariance Matrix

Statistic	Model 1A	1B	1C	1D*
v	18	18	18	18
Null chi sq	2079.91	2079.91	2079.91	2079.91
Null df	153	153	153	153
Noncentrality	1926.91	1926.91	1926.91	1926.91
^Model chi sq	502.90	390.93	272.61	1022.09
^Model df	135	132	120	150
Noncentrality	367.90	258.93	152.61	872.09
NC / df	2.73	1.96	1.27	5.81
^GFI	0.915	0.931	0.953	0.806
Pars Ratio	0.789	0.772	0.877	0.702
GFI*Pars	0.722	0.719	0.669	0.707
CFI	0.809	0.866	0.921	0.547
Pars Ratio	0.882	0.863	0.784	0.980
CFI*Pars	0.714	0.747	0.722	0.537

	1A*	1B*	1C*
v	18	18	18
Null chi sq	2079.91	2079.91	2079.91
Null df	153	153	153
Noncentrality	1926.91	1926.91	1926.91
^Model chi sq	803.08	677.88	731.76
^Model df	153	150	150
Noncentrality	650.08	527.88	581.76
NC / df	4.25	3.52	3.88
^GFI	0.850	0.874	0.866
Pars Ratio	0.895	0.877	0.877
GFI*Pars	0.761	0.767	0.760
CFI	0.663	0.726	0.698
Pars Ratio	1.000	0.980	0.980
CFI*Pars	0.663	0.712	0.684

Note. Models designated with asterisks involved fitting the factor loadings from Thompson, Webber and Berenson (1992) to the data in the present study. Because these models estimated fewer parameters, these models were more parsimonious and have more degrees of freedom.

Table 2
Fit Statistics for the Four Models
Involving Factors Extracted from the Correlation Matrix

Statistic	Model 2A	2B	2C	2D*
v	18	18	18	18
Null chi sq	2080.20	2080.20	2080.20	2080.20
Null df	153	153	153	153
Noncentrality	1927.20	1927.20	1927.20	1927.20
^Model chi sq	502.97	391.00	272.66	1070.84
^Model df	135	132	120	150
Noncentrality	367.97	259.00	152.66	920.84
NC / df	2.73	1.96	1.27	6.14
^GFI	0.915	0.931	0.953	0.793
Pars Ratio	0.789	0.772	0.702	0.877
GFI*Pars	0.722	0.719	0.669	0.696
CFI	0.809	0.866	0.921	0.522
Pars Ratio	0.882	0.863	0.784	0.980
CFI*Pars	0.714	0.747	0.722	0.512

	2A*	2B*	1C*
v	18	18	18
Null chi sq	2080.20	2080.20	2080.20
Null df	153	153	153
Noncentrality	1927.20	1927.20	1927.20
^Model chi sq	804.39	689.65	733.97
^Model df	153	150	150
Noncentrality	651.39	539.65	583.97
NC / df	4.26	3.60	3.89
^GFI	0.842	0.869	0.858
Pars Ratio	0.895	0.877	0.877
GFI*Pars	0.753	0.762	0.753
CFI	0.662	0.720	0.697
Pars Ratio	1.000	0.980	0.980
CFI*Pars	0.662	0.706	0.683

Note. Models designated with asterisks involved fitting the factor loadings from Thompson, Webber and Berenson (1992) to the data in the present study. Because these models estimated fewer parameters, these models were more parsimonious and have more degrees of freedom.

Table 3
Fit Statistics for the Four Models
Involving Factors Extracted from the Polychoric Correlation Matrix

Statistic	Model 3A	3B	3C	3D*
v	18	18	18	18
Null chi sq	3066.48	3066.48	3066.48	3066.48
Null df	153	153	153	153
Noncentrality	2913.48	2913.48	2913.48	2913.48
^Model chi sq	778.33	607.72	441.31	1583.94
^Model df	135	132	120	150
Noncentrality	643.33	475.72	321.31	1433.94
NC / df	4.77	3.60	2.68	9.56
^GFI	0.877	0.898	0.926	0.719
Pars Ratio	0.789	0.772	0.702	0.877
GFI*Pars	0.692	0.693	0.650	0.631
CFI	0.779	0.837	0.890	0.508
Pars Ratio	0.882	0.863	0.784	0.980
CFI*Pars	0.688	0.722	0.698	0.498

	3A*	3B*	3C*
v	18	18	18
Null chi sq	3066.48	3066.48	3066.48
Null df	153	153	153
Noncentrality	2913.48	2913.48	2913.48
^Model chi sq	1169.39	1011.94	1070.61
^Model df	153	150	150
Noncentrality	1016.39	861.94	920.61
NC / df	6.64	5.75	6.14
^GFI	0.785	0.820	0.808
Pars Ratio	0.895	0.877	0.877
GFI*Pars	0.702	0.719	0.709
CFI	0.651	0.704	0.684
Pars Ratio	1.000	0.980	0.980
CFI*Pars	0.651	0.690	0.671

Note. Models designated with asterisks involved fitting the factor loadings from Thompson, Webber and Berenson (1992) to the data in the present study. Because these models estimated fewer parameters, these models were more parsimonious and have more degrees of freedom.

Table 4
Fit Statistics for the Four Models
Involving Factors Extracted from the Correlation Matrix
Assuming the Responses were "Censored"

Statistic	Model 4A	4B	4C	4D*
v	18	18	18	18
Null chi sq	2248.99	2248.99	2248.99	2248.99
Null df	153	153	153	153
Noncentrality	2095.99	2095.99	2095.99	2095.99
^Model chi sq	554.55	405.08	441.31	1048.85
^Model df	135	132	120	150
Noncentrality	419.55	273.08	321.31	898.85
NC / df	3.11	2.07	2.68	5.99
^GFI	0.906	0.928	0.926	0.792
Pars Ratio	0.789	0.772	0.702	0.877
GFI*Pars	0.715	0.716	0.650	0.695
CFI	0.800	0.870	0.847	0.571
Pars Ratio	0.882	0.863	0.784	0.980
CFI*Pars	0.706	0.750	0.664	0.560

	4A*	4B*	4C*
v	18	18	18
Null chi sq	2248.99	2248.99	2248.99
Null df	153	153	153
Noncentrality	2095.99	2095.99	2095.99
^Model chi sq	883.12	727.11	778.35
^Model df	153	150	150
Noncentrality	730.12	577.11	628.35
NC / df	4.77	3.85	4.19
^GFI	0.823	0.861	0.846
Pars Ratio	0.895	0.877	0.877
GFI*Pars	0.736	0.755	0.742
CFI	0.652	0.725	0.700
Pars Ratio	1.000	0.980	0.980
CFI*Pars	0.652	0.710	0.686

Note. Models designated with asterisks involved fitting the factor loadings from Thompscn, Webber and Berenson (1992) to the data in the present study. Because these models estimated fewer parameters, these models were more parsimonious and have more degrees of freedom.

Table 5
Factor Parameters ("Lambda") and Interfactor Correlation Coefficients ("Phi") for Model "B" Extracted from the Matrix of Correlation Coefficients

LAMBDA X

	INTERNAL	PWOTHERS	CHANCE
MHLC1	0.373	0.000	0.000
MHLC2	0.000	0.000	0.452
MHLC3	0.000	0.566	0.000
MHLC4	0.000	0.000	0.382
MHLC5	0.000	0.479	0.000
MHLC6	0.527	0.000	0.000
MHLC7	0.000	0.273	0.000
MHLC8	0.369	0.000	0.000
MHLC9	0.000	0.000	0.568
MHLC10	0.000	0.592	0.000
MHLC11	0.000	0.000	0.497
MHLC12	0.695	0.000	0.000
MHLC13	0.719	0.000	0.000
MHLC14	0.000	0.593	0.000
MHLC15	0.000	0.000	0.495
MHLC16	0.000	0.000	0.453
MHLC17	0.751	0.000	0.000
MHLC18	0.000	0.628	0.000

PHI

	INTERNAL	PWOTHERS	CHANCE
INTERNAL	1.000		
PWOTHERS	-0.150	1.000	
CHANCE	-0.434	0.447	1.000

χ^2 WITH 132 DEGREES OF FREEDOM = 391.00 (P = .000)
GOODNESS OF FIT INDEX =0.931

Table 6
Factor Parameters ("Lambda") and Interfactor Correlation Coefficients ("Phi") for Model "C" Extracted from the Matrix of Correlation Coefficients

LAMBDA X

	INTERNAL	CHANCE	PWOTHERS	COMBINAT
MHLC1	0.377	0.000	0.000	0.000
MHLC2	0.000	0.475	0.000	0.156
MHLC3	0.000	0.000	0.654	-0.080
MHLC4	0.000	0.262	0.000	0.255
MHLC5	0.000	0.000	0.551	-0.075
MHLC6	0.530	0.000	0.000	0.000
MHLC7	0.000	0.000	0.261	0.058
MHLC8	0.372	0.000	0.000	0.000
MHLC9	0.000	0.313	0.000	0.484
MHLC10	0.000	0.000	0.514	0.320
MHLC11	0.000	0.208	0.000	0.527
MHLC12	0.688	0.000	0.000	0.000
MHLC13	0.720	0.000	0.000	0.000
MHLC14	0.000	0.000	0.572	0.116
MHLC15	0.000	0.512	0.000	0.170
MHLC16	0.000	0.127	0.000	0.552
MHLC17	0.752	0.000	0.000	0.000
MHLC18	0.000	0.000	0.556	0.266

PHI

	INTERNAL	CHANCE	PWOTHERS	COMBINAT
INTERNAL	1.000			
CHANCE	-0.650	1.000		
PWOTHERS	-0.138	0.426	1.000	
COMBINAT	0.000	0.000	0.000	1.000

χ^2 WITH 120 DEGREES OF FREEDOM = 272.66 (P = .000)
GOODNESS OF FIT INDEX =0.953

APPENDIX A
The 18 Items on the MHLC Scales

1. If I get sick, it is my own behavior which determines how soon I get well again.
2. No matter what I do, if I am going to get sick, I will get sick.
3. Having regular contact with my physician is the best way for me to avoid illness.
4. Most things that affect my health happen to me by accident.
5. Whenever I don't feel well, I should consult a medically trained professional.
6. I am in control of my health.
7. My family has a lot to do with my becoming sick or staying healthy.
8. When I get sick I am to blame.
9. Luck plays a big part in determining how soon I will recover from an illness.
10. Health professionals control my health.
11. My good health is largely a matter of good fortune.
12. The main thing which affects my health is what I myself do.
13. If I take care of myself, I can avoid illness.
14. Whenever I recover from an illness, it's usually because other people (for example doctors, nurses, family, friends) have been taking good care of me.
15. No matter what I do, I'm likely to get sick.
16. If it's meant to be, I will stay healthy.
17. If I take the right actions, I can stay healthy.
18. Regarding my health, I can only do what my doctors tell me to do.

Note. Items 1, 6, 8, 12, 13 and 17 were intended to measure the Internal scale. Items 3, 5, 7, 10, 14 and 18 were intended to measure the Powerful Others scale. Items 2, 4, 9, 11, 15 and 16 were intended to measure the Chance scale.