Modeling the Relations of Attributional Style, Expectancies, and Depression

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Structural modeling techniques were used to assess relations of attributional style, expectancies, and depression. According to an initial theoretical model, attributions are directly related to expectancies, and expectancies are directly related to depression, but attributions are only indirectly related to depression by means of their relation to expectancies. The results of Study 1 indicated that this model was flawed in 2 respects: (a) attributions for positive and negative events did not form a single latent variable, and (b) attributions for negative events both were indirectly related to depression by means of expectancies and were directly related to depression. For positive events only were indirectly related to depression by means of expectancies. The model derived in Study 1 was replicated in Study 2. Discussion centers on the interpretation of this modified model and on issues in the measurement of attributional style.

Attributions can be viewed as explanations that imply expectations about future events. Furthermore, many theorists argue that attributions have effects on affect and behavior because of their effects on expectancies about future events. Others go further to argue that attributions only have effects on affect and behavior because of their effects on expectancies about future events. The present article considers the mediational role of expectancies in the relation between attributions and depressive affect.

A model of behavioral self-regulation proposed by Carver and Scheier (1981; Scheier & Carver, 1988) is clearest in its advocacy of the position that expectancies mediate the effects of attribution on behavior. These authors endorse the view that

the prediction of behavior does not depend directly upon the attributions themselves. Behavior follows from the perception that responses will not produce desired outcomes, regardless of the reason for that perception. . . . Outcome expectancy is the critical parameter, and how that expectancy is determined is unimportant. (Carver & Scheier, 1981, p. 254)

Although this is perhaps the most extreme statement of the view that expectancies mediate the effects of attributions on behavior, most other theorists agree that expectancies mediate some of the effects of some attributions (e.g., Weiner, 1974, 1985). With respect to models that deal specifically with depression, Abramson, Seligman, and Teasdale (1978) propose that attributions of globality and stability, but not internality, have effects by means of their impact on expectancies. Thus, the generality of depression is proposed to be a function of globality attributions (i.e., the extent to which negative outcomes are expected to generalize to other situations), and the chronicity of depression is proposed to be a function of stability attributions (i.e., the extent to which negative outcomes are expected to continue in the future). In other words, these attributions lead to depression because of their effects on expectancies regarding the probability of future negative events. In contrast, internality attributions (i.e., the extent to which a negative outcome is judged to be due to self versus external circumstances) are proposed to have direct effects on the intensity of depression and depressive low self-esteem.

In general, research has supported an association between attributions and depression (Brewin, 1985). Indeed, Robins (1988) attributed much of the inconsistency in the literature to the relatively low statistical power of the typical research design. Consistent with such reasoning, a large-scale meta-analysis by Sweeney, Anderson, and Bailey (1986) found that when the results of 104 studies were statistically combined, internality, stability, and globality attributions for both positive and negative events were all related to depression. However, in keeping with recent theorizing by Abramson, Metalsky, and Alloy (1989), Sweeney et al. also found that effect sizes were larger for attributions regarding negative as opposed to positive events.

Despite general support for the reformulated learned helplessness theory of depression, more specific predictions regarding the role of expectancies and the differential effects of the attributional subcomponents have been obscured by the fact that most research (a) fails to measure and test the mediational influence of expectancies and (b) combines the various attributional components of globality, stability, and internality into a single measure of attributional style (Peterson & Seligman, 1984; Peterson et al., 1982).

By using a structural-modeling approach, the present study sought to test the hypothesis that expectancies mediate the influence of attributions on depression. Structural modeling is particularly useful in that it (a) allows for a test of the overall adequacy of an entire model in addition to individual tests of the model's subcomponents, (b) clearly identifies sources of ill fit, and (c) directly deals with the inherent unreliability of scales used in psychological research. Furthermore, unlike approaches that simply sum subcomponents to form a composite scale, structural modeling requires researchers to specify the theorized relations among the subcomponents in terms of latent variables, provides a test of this theorized measurement structure, and provides a test of the relations among the latent variables while retaining information about the unique aspects...
of the subcomponents. For all of these reasons, structural modeling was felt to be particularly suited to testing the theorized relations among attributions, expectancies, and depression.

Specific Hypotheses

The specific model tested in this study comprised a set of three general hypotheses:

1. Expectancies should be directly related to depression. This prediction is based on the self-regulation theory of Scheier and Carver (1988; Carver & Scheier, 1981), the reformulated learned helplessness theory of Abramson et al. (1978), the causal explanation theory of Peterson and Seligman (1984, and the hopelessness theory of depression of Abramson et al. (1989).

2. Attributions should be related to depression indirectly by means of their effects on expectancies. Again, this prediction is based on the theories of Scheier and Carver (1988), Abramson et al. (1978), Peterson and Seligman (1984) and Abramson et al. (1989).

3. Attributions should not be directly related to depression independent of expectancies. Scheier and Carver (1988; Carver & Scheier, 1981) are clearest in making this prediction. Peterson and Seligman (1984) and Abramson et al. (1989) seem to agree. In contrast, Abramson et al. (1978) suggest that internality attributions may affect depressive low self-esteem independent of expectancies.

In addition to these structural hypotheses, the present study also tested two different measurement models for attributional style. These measurement models correspond to the assumption that the components of attributional style are related to a single latent construct (e.g., Peterson & Seligman, 1984) versus the assumption that attributional style for positive and negative events should be considered separately (e.g., Abramson et al., 1989; Sweeney et al., 1986).

Study 1

Method

Subjects

Subjects were 165 undergraduates who participated in return for extra credit in an introductory psychology course. During the first week of classes, subjects completed a multiple-questionnaire booklet that included the instruments used in the present study. Subjects who failed to complete all items for the scales used in this study were excluded from further analysis. The final sample consisted of 140 subjects.

Instruments

Attributional style. All subjects completed the Attributional Style Questionnaire (ASQ; Peterson, Semmel, von Baeyer, Abramson, Metalsky, & Seligman, 1982). The ASQ consists of 12 hypothetical events (6 good and 6 bad). Subjects are asked to assume the event happened to them, specify a single cause for each event, and rate these causes on internal-external, stable-unstable, and global-specific dimensions. Peterson et al. (1982) reported coefficient alphas for the individual attributional dimensions that ranged from .44 to .69. Composite scores of the dimensions increase the reliabilities to .75 for positive events and .78 for negative events.

In support of the validity of the questionnaire, ASQ scores have been shown to predict the actual attributions subjects make for specific life events (e.g., Metalsky, Halberstadt, & Abramson, 1987), behavioral helplessness deficits (e.g., Alloy, Peterson, Abramson, & Seligman, 1984), and depressive symptom onset after stress (e.g., Cutrona, 1983; Metalsky, Abramson, Seligman, Semmel, & Peterson, 1982; Metalsky et al., 1987).

In the present study, the latent construct of attributional style for positive events was hypothesized to be reflected in three manifest variables: internality attributions (6 items; $\alpha = .43$), stability attributions (6 items; $\alpha = .51$), and globality attributions (6 items; $\alpha = .48$) for positive events. These scales were scored so that higher values reflected increased attributions of internality, stability, and globality. The latent construct of attributional style for negative events was also hypothesized to be reflected in three manifest variables: internality attributions (6 items; $\alpha = .27$), stability attributions (6 items; $\alpha = .52$), and globality attributions (6 items; $\alpha = .60$) for negative events. Once again, these scales were scored so that higher values reflected increased attributions of internality, stability, and globality.

Although the reliability estimates for all of the ASQ subscales are relatively low, they are in keeping with previous work (e.g., Peterson et al., 1982). We feel that such reliabilities provide further justification for the use of structural modeling with latent variables in that this procedure directly addresses the use of unreliable measures.

Expectancies. Subjects also completed the Life Orientation Test (LOT; Scheier & Carver, 1985) as a measure of dispositional expectancies. Scheier and Carver (1985) proposed this scale as a measure of dispositional expectancies about future events. The scale comprises eight substantive items and four filler items. Of the substantive items, four are phrased in a positive manner (e.g., “I always look on the bright side of things”), and four are phrased in a negative manner (e.g., “I rarely count on good things happening to me”). Typically, the positive and negative items are combined (after reversing responses to the negatively phrased items) to form a single optimism score. Scheier and Carver (1985) reported a reliability (coefficient alpha) of .76 for the LOT.

Research using this scale supports the hypothesis that generalized expectancies are related to depression. Thus, dispositional optimism was negatively related to depressive mood for women during their 3rd trimester of pregnancy and 3 weeks postpartum (Carver & Gaines, 1987). This inverse relationship held when initial level of depression was controlled. The relationship between depression and optimism was most pronounced for women who were not initially depressed, suggesting that optimism acts as a buffer to depressive symptoms.

Additional research using this scale has found that compared with pessimists, optimists (a) are able to cope more effectively with a stressful event (Scheier, Weintraub, & Carver, 1986), (b) report fewer physical symptoms (Scheier & Carver, 1985), (c) are more likely to complete an aftercare program after treatment for alcoholism (Strack, Carver, & Blaney, 1987), and (d) recover from coronary bypass surgery more quickly (Scheier et al., 1989). Each of these studies supports the view that dispositional outcome expectancies as measured by the LOT are predictive of behavioral consequences.

To estimate the latent construct of dispositional expectancies, the

\footnote{In addition to making internality, globality, and stability judgments for each event, subjects were asked to rate the importance of the situation were it to actually occur (Strube, 1985), and the extent to which they were personally responsible for the outcome (Rhodewalt, 1984). Given that these questions were not part of the original ASQ, they were not included in the present analysis.}
LOT was parceled by assigning every other item to one of two manifest variables.\footnote{See Bernstein and Teng (1989) and Marsh, Antill, and Cunningham (1989) for a description of the advantages of parceling techniques in estimating latent variables.} Each manifest variable was thus associated with four LOT items. The manifest variable composed of items 1, 4, 8, and 11 was associated with a Cronbach's alpha of .65. The manifest variable composed of items 3, 5, 9, and 12 was associated with a Cronbach's alpha of .70. These scales were scored so that higher values reflected increased positive expectancies (i.e., optimism).

**Depression.** Finally, subjects completed the Beck Depression Inventory (BDI; Beck, 1967). The BDI is a widely used self-report scale that has reasonable validity, internal consistency (e.g., Peterson, Schwartz, & Seligman, 1981) and test–retest reliability (Golin, Sweeney, & Shaeffer, 1981) in college samples.

To estimate the latent construct of depression, the BDI was parceled by assigning every other item to one of two manifest variables. The manifest variable composed of the 11 odd items was associated with a Cronbach's alpha of .66. The manifest variable composed of the 10 even items was associated with a Cronbach's alpha of .60. These scales were scored so that higher values reflected increased depression.

**Results**

**Assessment of Model Fit**

A variety of statistics exist to assess the adequacy of structural models with latent variables (Bollen, 1989). We report three statistics with each model: the chi-square goodness-of-fit test, the Bentler and Bonett (1980) normed fit index ($\Delta_1$), and Bollen's incremental fit index ($\Delta_2$). The chi-square goodness-of-fit test assesses the adequacy of the theorized model in terms of its ability to re-create the observed covariance matrix. Models that result in a predicted covariance matrix that significantly deviates from the observed covariance matrix are judged to be inadequate. Statistically significant values of chi-square therefore result from model rejection.

Unfortunately, chi-square is sensitive to sample size, so that large samples are more likely to yield significant values of chi-square and model rejection. Bentler and Bonett (1980) referred to this problem as involving the rejection of "minimally false" models. They therefore proposed a statistic that they claimed was less subject to sample size variation. This normed fit index, $\Delta_1$, represents the percentage of the variance in the observed covariance matrix that is accounted for by the theorized model. It can take on values from zero to one. Although it is not associated with a probability level, Bentler and Bonett proposed that models that account for less than 90% of the observed variance could probably be improved.

Contrary to the claims of Bentler and Bonett (1980), recent work by Marsh, Balla, and McDonald (1988) suggests that the normed fit index is one of a family of Type I incremental fit indexes that is affected by sample size (see also Mulaik et al., 1989). Specifically, $\Delta_1$ appears to underestimate the adequacy of models in small-to-moderate samples. Bollen (1988, 1989) therefore proposed an adjustment to this statistic. The resulting Type 2 incremental fit index, $\Delta_2$, appears to be less biased by sample size. Many authors note that Type 1 and Type 2 indexes approach the same asymptotic limit (e.g., Bentler, 1990; Bollen, 1989; Mulaik et al., 1989). Therefore, according to Mulaik et al. (1989),

on the average, for a given sample size, the Type 2 incremental-fit index is a better estimator of the asymptotic Type I incremental-fit index. . . . But the interpretation can still be that of a Type I incremental-fit index. (p. 435)

In the present studies, all of the models we ultimately judged to be adequate were associated with nonsignificant values of chi-square and values of $\Delta_1$ and $\Delta_2$ that exceeded .90.

**Measurement Models**

All models were assessed using LISREL VI (Jöreskog & Sörbom, 1984). Initial attempts to construct a measurement model with three latent variables (attributional style, expectancies, and depression) yielded results indicative of a fundamentally misspecified model. Inspection revealed that the specification of attributional style was particularly problematic. This variable was therefore modeled separately in an attempt to appropriately specify its structure.

**Structure of attributional style.** A series of analyses was conducted using only the six components of attributional style. An initial model specified all six components as related to a single latent variable. This model failed to fit the data, $\chi^2(9, N = 140) = 80.11, p < .001; \Delta_1 = .55; \Delta_2 = .58$. Modification indexes suggested that the fit of the model could be improved by allowing four errors to correlate. This model provided a relatively good fit of the data, $\chi^2(5, N = 140) = 2.65, p = .75; \Delta_1 = .99; \Delta_2 > 1.00$, and is depicted in the left half of Figure 1 as ASQ Measurement Model 2. The labeled large circle represents the latent (unmeasured) factor of attributional style and the rectangles represent observed (or measured) variables. The single headed arrows from the large circle to the rectangles indicate that the observed variables are theorized to be generated by the latent construct. The values within the small circles represent the unique portion of residual variance (uniqueness) that is not accounted for by the common factor.

As can be seen in this figure, three of the four errors that were allowed to correlate involved interrelations of items assessing attributional style for negative events. This pattern suggests that the data might be more appropriately modeled as involving separate latent variables for positive and negative event attributions. Such a model is depicted in the right half of Figure 1 as ASQ Measurement Model 3. This model also provided a good fit of the observed data, $\chi^2(7, N = 140) = 6.58, p = .47; \Delta_1 = .96; \Delta_2 = 1.00$. Furthermore, it is preferable to ASQ Measurement Model 2 on the basis of parsimony (it provides a good account of the data but requires fewer parameter estimates) and its consistency with existing theory (e.g., Abramson et al., 1989; Sweeney et al., 1986). This model was therefore used in subsequent tests of the relation of attributional style, expectancies, and depression.

**Measurement model of attributional style, expectancies, and depression.** Given an adequate representation of attributional style, we attempted again to specify a measurement model for
all 10 observed variables. Four latent variables were specified and allowed to intercorrelate: attributional style for positive events (3 indicators), attributional style for negative events (3 indicators), optimism (2 indicators), and depression (2 indicators). As in ASQ Measurement Model 3, the errors for positive and negative globality were allowed to correlate. When this measurement model was tested, the overall fit was adequate, $\chi^2(28, N = 140) = 40.03, p > .05, \Delta_1 = .91, \Delta_2 = .97.

Structural Models

Given an adequate measurement model, we tested an initial structural model to explain the relations among the four latent constructs. The hypothesized paths were based on the theoretical propositions of Carver and Scheier (1981). According to this approach, expectancies should mediate the effects of attributions on behavior. Thus Theoretical Model 1 specified that both positive attributional style and negative attributional style affect optimism and that optimism affects depression but that neither positive nor negative attributional style directly affects depression. As can be seen in Table 1 this model did not fit the observed data and was significantly different from the final measurement model. Theoretical Model 2 was therefore specified as including this path. As can be seen in Table 1, this model adequately fit the data, represented a significant improvement over Theoretical Model 1, and was not significantly different from the final measurement model. Theoretical Model 2 is presented in Figure 2. Modification indexes suggested that the model could not be substantially improved. (None exceeded the 5.00 cutoff recommended by Jöreskog and Sörbom, 1984.)

Supplemental Analyses: Plausible Alternative Models

Given that the direct path from negative-event attributions to depression was not predicted, a variety of alternative models were postulated as providing plausible explanations for this result. For example, the effects of stability and globality on depression may be mediated by dispositional expectancies (i.e., optimism), but the effect of internality may be independent of expectancy. The independent path from negative-event attributions to depression might therefore be a consequence of variance in the internality subcomponent that is not associated with expectancy. Although such an account is consistent with existing theory (e.g., Abramson et al., 1978), it does not account for the data. Most telling, when the model is respecified excluding negative-internality attributions (i.e., only globality and stability attributions are included as observed indicators of the negative-attribution latent variable), the direct path from negative-event attribution to depression remains. Thus, in this reduced data set, a model that includes this path still fits significantly better than a model that does not, $\chi^2(1, N = 140) = 9.64, p < .01, and
Table 1: Study I: Chi-Square Goodness-of-Fit Values, Fit Indexes, and Model Comparisons

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$ (N = 140)</th>
<th>df</th>
<th>p</th>
<th>$\Delta_1$</th>
<th>$\Delta_2$</th>
</tr>
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<td>Null model</td>
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<td>.00</td>
<td>.00</td>
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<td>Final measurement model</td>
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<td>28</td>
<td>&gt;.06</td>
<td>.91</td>
<td>.97</td>
</tr>
<tr>
<td>Theoretical Model 1</td>
<td>47.36</td>
<td>30</td>
<td>&lt;.05</td>
<td>.89</td>
<td>.96</td>
</tr>
<tr>
<td>Theoretical Model 2</td>
<td>40.14</td>
<td>29</td>
<td>&gt;.08</td>
<td>.91</td>
<td>.97</td>
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<tr>
<td>Model comparisons</td>
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<td></td>
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<tr>
<td>Model 1 vs measurement model</td>
<td>7.33</td>
<td>2</td>
<td>.025</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 1 vs Model 2</td>
<td>7.22</td>
<td>1</td>
<td>&lt;.01</td>
<td></td>
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<td>Model 2 vs measurement model</td>
<td>0.11</td>
<td>1</td>
<td>&gt;.25</td>
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</table>

Note. $\Delta_1 = \text{normed fit index}$. $\Delta_2 = \text{incremental fit index}$. Entries in the chi-square column under Model comparisons are differences and involve tests between nested models.

Discussion

The present results support a model in which attributional style has both direct and indirect effects on depression. That attributional style for negative events had direct effects on depression seems to contradict claims by Carver and Scheier (1981; Scheier & Carver, 1988) that the effects of attribution on behavior are totally mediated by expectancies. At the same time, consistent with the Carver and Scheier (1981) argument, attributional style for positive events had only indirect effects on depression by means of its effects on expectancies. The final structural model indicated support for four hypotheses. Each will be considered in turn:

![Study 1: final structural equation model](image)
1. Expectancies are directly related to depression. This effect is consistent with many theories and supports the validity of the LOT as a measure of dispositional expectancies (Scheier & Carver, 1985). Basically, the more positive a person's expectancies, the less likely that person is to be depressed.

2. Attributional style for positive events has indirect effects on depression by means of its effects on expectancies. Again, this effect is consistent with many theories. At the same time, the lack of a direct effect of attributional style for positive events on depression provides support for the strong position of Carver and Scheier (1981) that attributions only affect depression indirectly by means of expectancies.

3. Attributional style for negative events has indirect effects on depression by means of its effects on expectancies. Although predicted by many theories, this hypothesis was associated with a relatively weak effect: The parameter associated with this path had a near-significant critical ratio when included in the model ($p < .10$). Given that judgments of the adequacy of a model must be made both on the basis of theory and statistical inference (Anderson & Gerbing, 1988), we interpret the results as providing limited support for the prediction that attributional style for negative events has indirect effects on depression by means of its effects on expectancies.

4. Attributional style for negative events has direct effects on depression. That attributional style for negative events has a direct effect on depression appears to contradict the Carver and Scheier (1981; Scheier & Carver, 1988) position. Supplemental analyses eliminated two possible explanations of this effect: (a) It is due to an influence of negative-internality attributions that (unlike globality and stability attributions) is not mediated by expectancies, or (b) it is due to the use of an expectancy measure that includes both positive and negative expectancies.

A third possible explanation of the direct influence of negative attribution on depression is that the LOT is an inappropriate measure of expectancies. For example, Smith, Pope, Rhode-wait, and Poulton (1989) argued that the LOT is "virtually indistinguishable from measures of neuroticism" (p. 640). If this were the case, it might be possible to argue that the effects of the ASQ were mediated by expectancies but that this is obscured by the use of the LOT as a measure of expectancies. Such an argument is weakened by the fact that Smith et al. (1989) found that the LOT is highly related to another measure of expectancies (the Generalized Expectancy for Success Scale; Fibel & Hale, 1978), supporting the convergent validity of the LOT. Nevertheless, research that includes additional measures of expectancies would circumvent potential generalizability and validity problems with the LOT.

A fourth possible explanation of the direct influence of negative attribution on depression is that the result is unreliable. Structural-modeling techniques are designed to test the adequacy of a theorized model. The model originally theorized to account for the data was found to be inadequate and could therefore be rejected. At the same time, respecification of the model to provide a more adequate account of the data might unfairly capitalize on chance, hence, such respecified models should be regarded as tenuous until replicated.

**Study 2**

To address questions about the reliability of the results of Study 1 and the appropriateness of the LOT as a measure of expectancies, a second study was conducted. This study involved a basic replication of the model derived in Study 1. However, in Study 2 both expectancies and depression were assessed with two scales rather than relying on random parceling techniques.

**Method**

**Subjects**

Subjects were 147 undergraduates who participated in return for extra credit in an introductory psychology course. As in Study 1, subjects completed a multiple-questionnaire booklet that included the instruments used in the present study. Unlike Study 1, subjects participated in small groups, and the booklets comprised only questionnaires used in the present study. Subjects who failed to complete all items for all questionnaires were excluded from further analysis. The final sample consisted of 141 subjects.

**Instruments**

**Attributional style.** All subjects completed the ASQ (Peterson et al., 1982). In the present study, the latent construct of attributional style for positive events was hypothesized to be reflected in three manifest variables: internality attributions (6 items; $a = .42$), stability attributions (6 items; $a = .51$), and globality attributions (6 items; $a = .60$) for positive events. The latent construct of attributional style for negative events was also hypothesized to be reflected in three manifest variables: internality attributions (6 items; $a = .45$), stability attributions (6 items; $a = .65$), and globality attributions (6 items; $a = .67$) for negative events.

**Expectancies.** The latent construct of expectancies was hypothesized to be reflected in two manifest variables: the LOT (Scheier & Carver, 1985; 8 items; $a = .88$) and the Generalized Expectancy for Success Scale (Fibel & Hale, 1978; 30 items; $a = .91$).

**Depression.** The latent construct of depression was hypothesized to be reflected in two manifest variables: the BDI (Beck, 1967; 21 items; $a = .81$) and the Zung Self-Rating Depression Scale (Zung, 1965; 20 items; $a = .83$).

**Results**

**Measurement Models**

**Structure of attributional style.** All models were assessed using LISREL VI (Jöreskog & Sörbom, 1984). Because of the problems encountered in modeling the measurement structure of attributional style in Study 1, we conducted separate analyses on this set of measures before assessing the fit of the larger model. The three models of attributional style that were tested in Study 1 were applied to the data collected in Study 2. Once again, ASQ Measurement Model 1 specified all six components as related to a single latent variable and failed to fit the data, $\chi^2(9, N = 141) = 88.63, p < .001; \Delta_1 = .43; \Delta_2 = .46$. ASQ Measurement Model 2 involved a modification of Model 1 that allowed four errors to correlate and provided a good fit of the data, $\chi^2(5, N = 141) = .80, p = .98; \Delta_1 = .99; \Delta_2 > 1.00$. It is depicted in the left half of Figure 3. ASQ Measurement Model 3 specified separate latent variables for positive- and negative-event attributions. This model also provided a good fit of the observed data, $\chi^2(7, N = 141) = 1.22, p = .99; \Delta_1 = .99; \Delta_2 > 1.00$, and is depicted in the right half of Figure 3.

On the basis of these analyses, the data from Study 2 would appear to provide a replication of the relationships found in
Study 1. However, in addition to providing for separate tests of a model across two samples, structural-modeling techniques also allow for a simultaneous test of the hypothesis that the same model fits in two independent samples. Before testing the replication of a particular model, it is useful to test the hypothesis that the covariance matrices for the two studies are similar. In the present studies, this test yielded a nonsignificant chi-square, $\chi^2(21, N = 141) = 11.75, p = .95$, suggesting that the variances and covariances of the six subcomponents of attributional style are essentially invariant across samples. Although the covariance matrices are similar, it does not necessarily follow that the theorized model of the relations among the variables is the same across samples. Such a hypothesis requires a separate test that specifies the parameters observed in the first sample to be identical to those observed in the second sample. In the present case, a test of the similarity of ASQ Measurement Model 3 across samples (simultaneous invariance of $\Lambda$, $\Phi$, and $\Theta$ matrices) yielded a nonsignificant chi-square, $\chi^2(28, N = 141) = 17.75, p = .93$. As a consequence, we are confident in the robust nature of the measurement model for attributional style derived in Study 1.

Measurement model of attributional style, expectancies, and depression. As in Study 1, a final measurement model was specified as involving four intercorrelated latent variables: attributional style for positive events (three indicators), attributional style for negative events (three indicators), optimism (two indicators), and depression (two indicators). As in ASQ Measurement Model 3, the errors for positive and negative globality were allowed to correlate. When we tested this measurement model, the overall fit was adequate, $\chi^2(28, N = 141) = 32.42, p > .20$; $\Delta_1 = .93; \Delta_2 = .99$.

Unfortunately, a statistical comparison of this model against the final measurement model in Study 1 is not possible because additional measures of optimism and depression were included in Study 2.

Structural Model

The structural model derived in Study 1 was specified for Study 2. As can be seen in Table 2, this model adequately fit the data and was not significantly different from the final measurement model for all 10 observed indicators. This replication model is presented in Figure 4. Given the a priori nature of predictions, all significance tests are one-tailed. Modification indexes suggested that the model could not be substantially improved (none exceeded the 5.00 cutoff recommended by Jöreskog & Sörbom, 1984).

Readers interested in conducting such analyses are cautioned that they must be conducted on covariance, not correlation matrices (see Marsh & Hocevar, 1985).

Parameter estimates in Figure 4 appear more similar to those in Figure 2 if the Generalized Expectancy for Success Scale is dropped as an indicator of optimism and the LOT is randomly parcelled as in Study 1. We are unsure what to make of this fact.

The final structural models for Studies 1 and 2 were reassessed using Bentler’s (1989) EQS program. In addition to providing a check on our model specification and results, EQS allows for the testing of nonstandard, specific effects (Bentler, 1990; Newcomb & Bentler, 1988) by means of its application of Lagrange multiplier tests to assess potential for model improvement. Although these tests suggested one specific effect in Study 1 and two such effects in Study 2, the nature of these effects differed across studies. They would therefore appear to be due to random fluctuations in the data.
Table 2

Study 2: Chi-Square Goodness-of-Fit Values, Fit Indexes, and Model Comparisons

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<th>Model</th>
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Note. $\Delta_1 = $ normed fit index. $\Delta_2 = $ incremental fit index. The chi-square for comparison of the replication model vs. the measurement model (1.52) is a difference and involves tests between tested models.

General Discussion

Study 2 provides an impressive replication of the results of Study 1 with respect to both the measurement of attributional style and the structural relations among the latent variables of attributions, expectancies, and depression. In doing so, Study 2 provides support for models that treat positive- and negative-event attributions separately (e.g., Abramson et al., 1989) and models that theorize a mediational role of expectancies in the influence of attributions on depression (e.g., Abramson et al., 1978; Carver & Scheier, 1981). These results do not, however, support a claim that attributions are associated with depression only because of their association with expectancies (Carver & Scheier, 1981). In particular, negative-event attributions seem to be associated with depression independent of expectancies. The results of Study 2 eliminate two alternative explanations of the structural model derived in Study 1: (a) that it resulted from capitalization on chance fluctuations in the data and (b) that it was a spurious function of the use of the LOT as a measure of expectancies. In addition to providing convergent validity for the LOT, the fact that expectancy and negative-event attributions were independently associated with depression in both Study 1 and Study 2 contradicts claims by Smith et al. (1989) that the LOT lacks discriminant validity. Supplemental analyses designed explicitly to test the claim that measures of optimism are virtually indistinguishable from measures of negative affectivity such as depression (Smith et al., 1989) strongly contradict the hypothesis: A two-factor model of optimism and depression fit the data far better than a one-factor model of these variables in both Study 1, $\chi^2(1, N = 140) = 91.09, p < .001$, and Study 2, $\chi^2(1, N = 141) = 32.85, p < .001$. Thus, it would appear premature to claim that constructs such as optimism and measures such as the LOT lack validity (see also Hull, Tedlie, & Lehn, 1990).

Independent Association of Negative-EventAttributions and Depression

The principal paths in the final structural model are easily explained by existing theory: Explanations of positive and negative events are associated with expectancies regarding their fu-
future recurrence; increased negative expectancies are associated with increased risk of depression. However, the direct path from negative-event attributions to depression requires additional explanation. There are a number of possible accounts for this direct path. These accounts all share in common the notion that attributions are explanations and as such imbue an event with meaning beyond simply implying that the event will or will not recur. Two examples involve subjects' evaluations of themselves as a consequence of their attributions for an event. According to Brewin and Furnham (1986), attributions are related to depression because they are associated with judgments that one's own problems are unique. As a consequence, people who make internal, stable, global attributions for negative events may feel that their lot in life is significantly worse than others. Such negative social comparison may be associated with depression independent of judgments regarding the probability of future events (i.e., expectancies) both because people feel bad after such negative social comparisons (e.g., Tesser & Campbell, 1983) and because they seek to associate with others who are equally miserable (Wenzlaff & Prohaska, 1989), thus exacerbating their own dysphoria.

A related account has been advanced by Wollert and Rowley (1987). According to these authors, attributions as explanations for an event are associated with sanctions of credit or blame. Self-applied sanctions as a consequence of internal, stable, global attributions for a negative event may play a causal role in subsequent depression. Again, such negative self-sanctions may be associated with depression independent of judgments regarding the probability of future events.

A different approach is suggested by the work of Sacks and Bugental (1987) and the theories of Coates and Wortman (1980). In a study by Sacks and Bugental, attributional style was related to how subjects interacted with others. Specifically, subjects who tended to respond to failure with internal, stable, and global attributions reported greater hostility and showed more tension and less pleasantness in their verbal and nonverbal behavior toward others after interactions with unresponsive others. Although this did not result in the social rejection of these subjects in the laboratory study by Sacks and Bugental, several authors have suggested that the unpleasantness of interaction with depressed people may lead to behavioral patterns that serve to maintain and exacerbate the depressed person's dysphoria (e.g., Coates & Wortman, 1980; Coyn, 1976a, 1976b). Once again, such an effect might exist independent of any association of attribution and expectancies.

Each of these accounts has in common the notion that explanations (i.e., attributions) are not identical to expectations. Furthermore, explanatory styles with regard to negative events may have implications for depressive mood beyond the implied probability of similar future events. Although the present research did not directly test a specific account of this independent relation, it does suggest the utility of conceiving the association of attributions and depression as existing for more reasons than their joint association with expectancy.

Measurement of Attributional Style

Positive- Versus Negative-Event Attritions

Despite general support for the existence of a relationship between attributional style and depression (Robins, 1988; Sweeney et al., 1986), controversy remains regarding the exact measurement of attributional style (e.g., Carver, 1989; Perloff & Persons, 1988). Much of this controversy concerns the multidimensional nature of the ASQ. For example, Perloff and Persons argued that equal weighting of the subcomponents of the ASQ would result in biased estimates of effects. Similarly, Carver (1989) argued that forming an ASQ composite score would obscure differential effects of the subcomponents across studies. In support of an argument that some subcomponents of the ASQ may be more strongly related to depression than others, Sweeney et al. (1986) found that attributional style for negative events was more strongly related to depression than attributional style for positive events.

The present study adopted a latent-variable approach to the measurement of attributional style. Initial attempts to model the components of attributional style as related to a single latent variable yielded a statistically unacceptable solution. Subsequent attempts to model attributional style for positive and negative events separately yielded more acceptable solutions. Such findings support the contention that the subcomponents of the ASQ should not be combined to form a total score (Carver, 1989) and that attributional style for negative and positive events should be considered separately (e.g., Abramson et al., 1989; Sweeney et al., 1986). At the same time, each of the six subcomponents of the ASQ were significantly related to one of the two latent variables formed for positive- and negative-event attributions. In addition to being significantly related to these latent variables, with one exception the subcomponents appeared to be related to each other only because of their relations to these latent variables. Thus, 14 of 15 interrelations among the ASQ subcomponents were adequately captured in terms of the simple model involving two latent variables.

Globality Attributions

The only exception to the perfect adequacy of the positive-negative-event model of attributions involved the interrelation of globality attributions. Although globality attributions for positive and negative events were significantly related to their respective latent variables for positive and negative events, they shared more variance with each other than could be explained by these latent variables. As a consequence, their errors were allowed to correlate. The fact that this relationship replicated across two independent samples suggests the need for a substantive interpretation.

The simplest interpretation of the correlated globality errors involves shared method variance: Other things being equal, ratings of globality share more in common with each other than they share with ratings of stability and internality. From this perspective, the need to allow globality errors to correlate is less surprising than the lack of a need to allow positive-negative-stability and positive-negative-internality errors to correlate. Although allowing the globality errors to correlate improves model fit by taking into account the existence of shared variance, it does so in such a way that these interrelations remain essentially outside the structural model of interest. This is appropriate if the shared variance is due to theoretically irrelevant factors (e.g., method variance).

On the other hand, the correlated errors may represent a theoretically relevant factor. To explore this possibility, we cre-
ated a separate globality factor (in addition to the positive-negative-event factors) and assessed its influence within our more general model. In the present case, positive and negative globality measures had dual loadings: Each loaded on their respective positive-negative-event factor and the general globality factor.

The newly created globality factor was associated with serious statistical problems. First, unless certain structural constraints were imposed, specification of a separate globality factor resulted in a nonidentified model. Second, even when such constraints were imposed, the model yielded negative variance estimates in both Study 1 and Study 2. Such offending estimates are typically attributed to either sampling fluctuations or model misspecification (Dillon, Kumar, & Mulani, 1987). The fact that similar estimates occurred in both of the present studies suggests that they may not be due to sampling fluctuations, but rather stem from model misspecification. Finally, whereas models that include a separate globality factor suffer serious problems, models that do not incorporate a globality factor do not appear to suffer from its absence: Inspection of the patterns of normalized residuals and Lagrange multiplier tests (see Footnote 5) associated with the latter models did not suggest that predictive variance uniquely associated with the globality measures was going unattended.

Because the globality factor was associated with serious problems and appeared to be unnecessary, we are inclined to view the correlated globality errors as evidence of theoretically uninteresting method variance. Nevertheless, a separate globality factor might prove useful in future research on other models. To avoid problems with identification and misspecification, we recommend that researchers interested in testing such a globality factor develop indicators that are uniquely associated with this latent variable.

Advantages of the Structural-Modeling Approach

The advantages of a latent-modeling approach to the measure of attributional style are numerous (see Hull, Lehn, & Tedlie, in press). First, each study that adopts such an approach provides a test of the convergent and discriminant validity of the construct (i.e., do the measures cohere in indicating an underlying construct that is distinct from other latent constructs included in the model?). Second, such measurement models are not biased by the equal-weighting approach criticized by Perloff and Persons (1988), nor does publication of measurement diagrams (e.g., Figures 1 and 3) obscure the contribution of the subcomponents to the latent variable as does the formation of the ASQ composite (see Carver, 1989). Third, unlike Carver's recommendation of analyzing the data using each separate subcomponent, specification of latent variables on the basis of theoretical and empirical knowledge lessens the likelihood of unduly capitalizing on chance.

In addition, unlike other recommended approaches, latent-variable modeling explicitly deals with the unreliability of measured variables by relegating such variance to an error term. Furthermore, these error estimates contain both variance attributable to measurement error and variance associated with the unique aspects of the indicator (i.e., uniqueness). Such uniquenesses may exist as important predictors in their own right. Bentler (1990; Newcomb & Bentler, 1988) has termed these specific effects to distinguish them from the more general effects of latent variables. Although this information is lost in the composite score approach, latent models that fail to consider uniqueness that are actually important predictors of other variables will demonstrate ill fit. In the present research, the models that appear in Figures 2 and 4 provided an adequate fit of the data so that no additional specific effects were necessary (see Footnote 5).

Methodological Limitations of LISREL Modeling

Despite the advantages of structural-modeling techniques, this approach to theory testing also has its limitations. Most of these limitations are endemic to all research on attributional style, expectancy, and depression. Nevertheless, it is important to be clear about the nature and interpretation of the present results. In particular, the fact that structural modeling does not provide evidence of causality needs to be made explicit (Breckler, 1990; Cliff, 1983). Although true experimentation also frequently fails in establishing causality (see Bollen, 1989), random assignment does provide a degree of control unavailable to observational studies. Nevertheless, random assignment is not always practical (or ethical) when dealing with issues such as depression, nor are the analysis of variance techniques traditionally associated with experimental designs sufficient to test mediational hypotheses (Baron & Kenny, 1986; Taylor & Fiske, 1981).

A second limitation concerns the fact that structural modeling does not typically result in a demonstration of the superiority of one particular model over all possible alternative models (see Breckler, 1990). Given even a small set of observed variables, a bewildering array of possible models may be specified. Most of these models will not fit the data, many that do provide adequate fits will not fit as well as the researchers' final model, and many that do fit as well as the researchers' final model may have no substantive interpretation. Nevertheless, some subset of possible models may exist that fit the data as well as the researchers' final model and do have substantive meaning (with respect to depression and attributions, see Brewin, 1985). Although it would be unreasonable to require researchers to second-guess their data by modeling all such possible alternative models, researchers should make their data sets freely available to anyone interested in testing their own alternative models. So we include the correlations, means, and standard deviations for both samples used in the current research (see the Appendix).

If structural modeling does not allow for causal conclusions and does not eliminate all possible alternative models, then what does it do, and how should it best be used? In our minds, structural-modeling results should be conceived as tests of hypothesized associations between variables. Although the existence of such an association does not prove causal influence, causal influence becomes implausible in the absence of an association. Thus, in the present studies, the paths from attributional style for positive and negative events to expectancies and from expectancies to depression were found to be statistically significant as theorized by Carver and Scheier (1981). Although this does not prove that attributional style causes expectancies that cause depression, it does provide useful knowledge. Specifically, it provides evidence in support of a particular theory of
associative links between these variables and fails to discon-
firm the hypothesis that attributional style causes optimism,
which in turn causes depression. Furthermore, it demonstrates
the inadequacy of particular theoretical approaches (e.g., in
the present studies, the assumption that the six components of
attributional style are associated with a single latent variable) and
the superiority of one particular model over a specific alterna-
tive model (e.g., in the present studies, the superiority of a model
that includes a direct association between negative-event attrib-
utions and depression over a model that does not include this
link).

Conclusion

Two independent studies provided support for a particular
model of attributional style, expectancies, and depression. Key
aspects of this model include (a) the specification of separate
latent variables for positive- and negative-event attributions, (b)
independent associations between positive- and negative-event
attributions and expectancies, (c) a direct association between
expectancies and depression, and (d) a direct association be-
tween negative-event attributions and depression. Although it
would be inappropriate to claim that this final structural model
was statistically acceptable (because structural modeling does
not allow for acceptance of a model), such a model might be
adopted as a set of working hypotheses for future research.
Thus, despite the fact that proof may be impossible, such a
model will prove useful if the accumulated evidence becomes
"inescapably consistent" (Taylor & Fiske, 1981, pp. 505–506)
with its theorized structure.

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tin, 97, 562–582.


## Table A1

**Statistics for Study 1 (n = 140)**

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**Note.** LOT1 = first manifest variable with 4 Life Orientation Test (LOT) items; LOT2 = second manifest variable with 4 LOT items; BDI1 = first manifest variable with 11 BDI (Beck Depression Inventory) items; BDI2 = second manifest variable with 10 BDI items; P-INT = positive internality; P-STA = positive stability; P-GLO = positive globality; N-INT = negative internality; N-STA = negative stability; N-GLO = negative globality.

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**SD**

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**Note.** LOT = Life Orientation Test; GESS = Generalized Expectancy for Success Scale; BDI = Beck Depression Inventory; ZUNG = Zung Self-Rating Depression Scale; P-INT = positive internality; P-STA = positive stability; P-GLO = positive globality; N-INT = negative internality; N-STA = negative stability; N-GLO = negative globality.