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On the Use of the Causal Dimension Scale in a Field Setting: A Test With Confirmatory Factor Analysis in Success and Failure Situations

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We tested the reliability and validity of the Causal Dimension Scale (CDS) within success and failure conditions in a real-life achievement situation. A total of 260 undergraduate students who had just received their marks on a midterm exam were asked to fill out a questionnaire that included questions dealing with their perceptions of success and failure on the exam and on the CDS. Confirmatory factor and internal consistency analyses were performed on the overall sample, as well as on the data from the success and failure conditions. Results showed that internal consistency was found to be adequate for the Locus and Stability subscales but not for the Control subscale. Results of the confirmatory factor analyses provided partial support for the validity of the CDS factor structure in that three-factor solutions were obtained in all three conditions. However, further analyses revealed that an acceptable fit for the data was obtained only when obliqueness, involving the Locus factor with those of Stability and Control, and cross loadings were incorporated in the factor structures. Of particular interest were the findings of a multigroup confirmatory factor analysis that revealed that solutions for the success and failure conditions were significantly different. The present set of findings provide some support for the reliability and validity of the CDS. However, we suggested that more work be conducted on the scale—especially the Control subscale—before the CDS can be used with full confidence in research.

In recent years, much attention has been devoted to the study of achievement attributions. Without a doubt, Weiner's attribution theory has been the impetus of such work. According to the theory, individuals ascribe causes for success and failure (either their own or anothers') and these attributions have important consequences both at the intra- and interpersonal levels (see Weiner, 1985a, for a review).

Weiner's theory has undergone several changes over the last decade (Weiner, 1972, 1974, 1979, 1985a; Weiner et al., 1971). Weiner et al. (1971) originally postulated that there were two dimensions of causality: locus of control (now termed *locus of causality*) and stability. Later, on the basis of the work of Rosenbaum (1972), Weiner (1974) proposed a third dimension, intentionality. More recently, this third dimension has been reconceptualized and is now termed *control* (see Weiner, 1979, 1985a). Weiner, in this most recent position, proposed that causal attributions can be classified according to a 2 × 2 × 2 (Internal/External Locus of Causality × Stability/Unstability × Controllability/Uncontrollability) orthogonal taxonomy. Task difficulty, for instance, can be seen as being external, stable, and uncontrollable, whereas effort may be perceived as being internal, unstable, and controllable.

Recent research generally supports the taxonomy. Using statistical techniques such as factor or cluster analysis (Meyer, 1980; Meyer & Koelb, 1982; Wimer & Kelley, 1982), multidimensional scaling (Michela, Peplau, & Weeks, 1982; Passer, 1977; Passer, Kelley, & Michela, 1978; Stern, 1983), and correlations with a priori schemes (Stern, 1983), researchers have repeatedly uncovered the three dimensions postulated by Weiner. Specifically, the locus dimension was obtained in all seven studies mentioned here, with the possible exception of that of Passer et al. (1978). Stability, on the other hand, was identified in all of the studies except those of Passer (1977) and, perhaps, Wimer and Kelley (1982) and Passer et al. (1978). Finally, all seven studies, with the exception of those of Wimer and Kelley (1982) and Michela et al. (1982), reported a dimension akin to that of control. Thus, support for the existence of Weiner's three-dimensional taxonomy is strong (see Weiner, 1985a, for a lengthier discussion on this issue).

A major point made by Weiner (1979) in his reconceptualization is that properties inherent in the causal dimensions produce important consequences on affect, expectancies, and behavior. This implies that causal dimensions must be correctly

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assessed. In general, four strategies have been used in order to translate causal attributions into causal dimensions. In the first and most frequently used strategy, researchers ask subjects to fill out attribution scales; researchers later add or subtract scale values according to their assumed properties. For example, an approach widely used is to ask subjects to fill out scales on attributions to ability, effort, luck, and task difficulty. Subjects' scores on the Ability and Effort scales, on one hand, and to Luck and Task Difficulty, on the other, are added. The latter sum is then subtracted from the former, which yields an internality index (cf. Weiner et al., 1971). A second strategy consists of asking subjects to write open-ended attributions that are later coded by experts in terms of their assumed properties (e.g., Lau & Russell, 1980; Orvis, Kelley, & Butler, 1976). A third and related strategy deals with coding subjects' open-ended attributions according to a more objective scheme, such as the one proposed by Elig and Frieze (1975). Finally, the fourth and certainly least used strategy consists of asking subjects to code their own attributions on scales dealing with pertinent causal dimensions (e.g., Forsyth & McMillan, 1981; Wong & Weiner, 1981).[1] Typically, one scale per dimension is used.

Russell (1982) recently suggested that the first three approaches on causal dimension assessment are inadequate because they suffer from the "fundamental attribution researcher error" (p. 1137). That is, it is assumed that the researcher can correctly interpret the meaning of the individual's causal attributions. Russell argued rather convincingly that the researcher and the subject may not always agree on such meaning. Factors such as the ambiguity of the attributional statement, individual differences, and situational variability may lead the researcher to misjudge the underlying properties of a given attribution. Ronis, Hansen, and O'Leary (1983) have substantiated Russell's claims. Using the first coding strategy presented earlier (the Locus and Stability indexes), these researchers have shown that to translate subjects' attributions into a Stability index represents an invalid assessment of the stability dimension. The Locus index, however, proved to be a valid assessment of the locus dimension (see Weiner, 1983, for more on this issue).

In light of these problems, Russell (1982) proposed the use of the Causal Dimension Scale (CDS). With the CDS, the attributor (the subject), and not the researcher, codes the attributional statements into causal dimensions. Subjects are first asked to write (an) open-ended attributional statement(s) explaining the outcome. Subjects are then asked to rate the attribution(s) on nine 9-point scales assessing Weiner's dimensions of locus, stability, and control. Each dimension is represented by three items that are summed, yielding a score for each dimension. Thus, the CDS is based in the tradition of the fourth coding strategy discussed earlier, as it assesses subjects' own perceptions of causal dimensions. However, the CDS goes beyond this fourth strategy in using *several* items to tap each causal dimension. This should enhance the reliability of causal dimension assessment.

Russell (1982) reported the results of two initial studies that provided preliminary support for the reliability and validity of the scale. In these studies, subjects were asked to read hypothetical scenarios depicting success and failure situations that were due to causes reflecting Weiner's taxonomy. In general, results from the two studies showed divergent validity for the individual scales in that each one was most affected by the dimension it represented (e.g., the effect of a stable cause was more important on the three stability items than on the locus or control items). A hedonic or self-serving bias was also found. In line with previous findings in the attribution literature (e.g., Zuckerman, 1979), subjects' attributions for success were perceived as more internal, stable, and controllable than were attributions for failure. Furthermore, all three subscales were found to have relatively good internal consistency. Finally, results of an exploratory factor analysis using varimax rotation revealed an orthogonal three-factor solution corresponding to the three subscales.

More recently, Russell and his colleagues (McAuley, Russell, & Gross, 1983; Russell et al., 1985; Russell & McAuley, 1986; Russell, McAuley, & Tarico, 1987) tested the predictive validity of the CDS in various experimental and field studies. In general, results from these studies show that the Locus of Causality and the Control subscales are related to affective experiences in sport and education achievement situations and that the controllability of attributions for a student's performance influences how that performance is evaluated by others.

Although these results seem to indicate that the CDS is valid and reliable, such a conclusion may be premature for several reasons. First, although results presented by Russell and his colleagues are indicative of the usefulness of the CDS, there is a clear need for further research in order to replicate the CDS factor structure. Indeed, no study other than Russell's (1982) has tested the factor structure of the CDS. Second, Russell's factor analysis results were obtained with the use of scenarios depicting hypothetical situations. As Russell (1982) himself suggested, "the validity of the measure in assessing causal dimensions in real-world settings needs to be established" (p. 1143). Third, because of statistical dependence in the data (a repeated measure design was used), Russell was unable to conduct a confirmatory factor analysis and had to rely on exploratory factor analysis to test the validity of the CDS. Although exploratory factor analysis is appropriate in the developing phase of an instrument, confirmatory factor analysis is deemed more adequate when assessing the validity of the developed instrument. Therefore, the adequacy of the CDS factor structure should be investigated through confirmatory factor analysis. A fourth and final consideration deals with the fact that the factor analysis reported by Russell was performed on the data obtained from the collapsed success and failure conditions. There is no indication in the literature to the effect that success and failure should yield invariably identical causal dimensions. In fact, certain studies (Dweck & Goetz, 1978; Wong & Weiner, 1981) revealed that success and failure may represent different perspectives of the attribution process. It thus appears important that analyses on the CDS be conducted within success and failure conditions.

[1] Note that other questionnaires such as the Attributional Style Questionnaire for adults (Seligman, Abramson, Semmel, & von Bayer, 1979) and children (Seligman et al., 1984) also tap individuals' perceptions of causal dimensions. However, these questionnaires measure people's stable attributional style. Thus, although related to the present topic, these personality measures are beyond the scope of this article and will not be discussed here.

The purpose of the present study was to assess the reliability and validity of the CDS, taking into account the various points raised earlier. More specifically, the present study was conducted in a real-life setting in which college undergraduate students who had just received their marks on a midterm exam were asked first to assess their performance on the exam and then to fill out the CDS. This allowed the assessment of the reliability and validity of the CDS for the overall sample, as well as assessment within perceived success and failure conditions. This strategy also allowed testing for the hedonic bias reported by Russell (1982). Reliability was assessed through internal consistency analyses, and the validity of the CDS was ascertained via confirmatory factor analyses. In line with Russell, we hypothesized that the CDS would be found reliable and valid with the overall sample (across success and failure). However, no predictions were made regarding the reliability and validity of the scale within success and failure conditions. Finally, we predicted that subjects would perceive the attributions for success as more internal, stable, and controllable than attributions for failure.

Method

Subjects

Subjects were 260 male and female college undergraduates who were enrolled in four sections of an introduction to social psychology course and in one section of an introduction to personality course. Subjects had no prior knowledge of attribution research before participating in this experiment.

Questionnaire (Test Rating Form)

Students were asked four questions in addition to the CDS. First, subjects were asked to indicate their gender. Second, subjects were asked to put down their actual score on the exam; this led subjects to focus on their performance. Third, subjects responded to the question "How would you evaluate your performance on the exam?" on a 9-point scale ranging from *very poorly* (1) to *very well* (9). And fourth, subjects responded to a similar question, "How well do you think you did on the exam?" again on a 9-point scale ranging from *very poorly* to *very well*. These two scales served to measure subjects' subjective appraisal of success and failure on the test. Subjects then filled out the CDS. As we mentioned earlier, the CDS consists of nine 9-point scales, that is, three items representing each of the locus, stability, and control dimensions proposed by Weiner (1979).

Procedures

Following reception of their test mark, subjects were asked to "complete a 'Test Rating Form' that would provide information regarding their reactions to and appraisals of the test" (Forsyth & McMillan, 1981, p. 396). Students were asked not to talk to fellow students. Furthermore, students were not told of the group test mean, so as to preserve the subjective quality of the performance evaluation. Filling out the questionnaire took between 5 to 10 min. Following completion of the questionnaire, students were told of the actual purpose of the study and were thanked for their participation.

Results

Results of a series of t tests showed that no differences existed between men and women on any of the measures. Thus, sex is not considered in the analyses to be reported. A correlation of .79 ($p < .0001$) was obtained between the two measures of perceived success and failure. The two measures were therefore summed, yielding a composite index of perceived success and failure. On the basis of this index, subjects who reported a score greater than 10 ($n = 109$) were assigned to the success condition and subjects who scored less than 10 ($n = 138$) were assigned to the failure condition. Subjects who had a score of 10 (middle of the scale), as well as subjects with missing data, were not retained in the analyses. The means for the perceived success and failure groups were, respectively, 12.54 ($SD = 2.1$) and 5.87 ($SD = 2.1$).

Internal Consistency Scores

Internal consistency values were assessed through Cronbach alphas. The alpha values for each of the three conditions are presented at the bottom of Table 3. In general, these values are lower than those reported by Russell (1982). Although the values for the Locus and Stability factors appear generally adequate, values for the Control factor are rather low (between .42 and .53). This indicates that the Locus and Stability subscales are composed of relatively homogeneous items, whereas the Control subscale is rather heterogeneous in nature.

Confirmatory Factor Analyses

Confirmatory factor analyses were performed on both the covariance and correlation matrixes, using the LISREL VI procedure with maximum likelihood estimation (Jöreskog & Sörbom, 1984). This procedure provides statistical assessment of the relative adequacy of alternative models submitted to explain the input matrix. The fitting function estimated by the procedure provides a chi-square statistic that is a function of the difference between the model examined and a saturated model (with a perfect fit) consisting of all possible sources of variance and covariance among the variables. The chi-square statistic is especially useful for the comparison of alternative hierarchically organized models because the difference in chi-square of two such models is a test of significance of the parameters added from one model to the other. Note, however, that the chi-square is also a function of sample size: the larger the number of subjects, the higher the chi-square values. For this reason, an incremental fit Δ (delta) index (Bentler & Bonett, 1980) is also computed from the chi-square statistics obtained on the two alternatives models. This index, which varies from 0 to 1, is a measure of the practical improvement in fit from one model to the other. (For more information on confirmatory factor analysis using the LISREL procedures, see Jöreskog & Sörbom, 1984, and Bentler, 1980.)

Assessment of model adequacy in the present study was provided by three parameters: (a) a chi-square statistic of the difference between a given model and the fully saturated model; (b) a chi-square difference test comparing nested alternative models, and thus providing a significance test of the parameter that differs among the two models; and (c) the Bentler and Bonett (1980) incremental fit (Δ) index.

The strategy used in the analyses was the following. On the basis of Russell's (1982) results, an orthogonal three-factor so-

Table 1
Input Correlation Matrixes for Success and Failure Conditions

Item	1	2	3	4	5	6	7	8	9
1. loc1	—	.612	.601	.524	.230	.301	.199	.423	.020
2. loc2	.494	—	.770	.328	.126	.194	.251	.293	.174
3. loc3	.469	.586	—	.350	.068	.138	.280	.297	.119
4. sta1	.114	.136	.184	—	.419	.586	−.014	.475	.001
5. sta2	−.022	−.147	−.267	.358	—	.641	−.219	.227	−.082
6. sta3	.082	.111	−.051	.285	.325	—	.016	.226	−.067
7. con1	.340	.215	.208	−.096	−.442	−.119	—	.187	.323
8. con2	.087	.071	.088	.086	−.177	.162	.186	—	.303
9. con3	.120	−.016	.016	−.064	−.207	.046	.282	.111	—

Note. Intercorrelations for success and failure conditions are, respectively, above and below the diagonal. loc = locus; sta = stability; and con = control.

lution was initially estimated from the input correlation and covariance matrixes for the success, failure, and overall conditions. In the next step, a heuristic search was made to improve fit by means of examining the first-order derivatives of the parameters. This led to a comparison between the orthogonal three-factor model and more complex models suggested by the modification indices of the LISREL procedure. These indexes are chi-square variates reflecting the degree of inconsistency of the value of a fixed parameter with the input matrix. The first of these models was an oblique solution that included nonzero correlations between the Locus factor and the other two factors.[2] More complex models involved cross loadings of some items on more than one factor. Results from the analyses performed on the covariance matrices yielded exactly the same pattern as those with the correlation matrixes. For the sake of brevity and ease of interpretability, only the analyses conducted on the correlation matrices are reported. The correlation matrixes for the success and failure conditions appear in Table 1.

Table 2 summarizes the chi-square values of the various models examined in the LISREL analyses for all three conditions. Results revealed that the orthogonal three-factor model represented a significant improvement over the null model in all conditions, all χ^2s(9) > 158, all *p*s < .001. This model was not very satisfying, however. The oblique three-factor model involving correlations between the Locus and Stability factors and the Locus and Control factors provided significant increments in fit over the orthogonal model in all three conditions, all χ^2s(2) > 13.1, all *p*s < .01. Yet, even this oblique model did not account well for the data. Therefore, a third model was tested. In Model 3, a loading from Item 5 (stability) was added to the control factor in all conditions. This item loaded negatively on the control factor in all conditions, taking values ranging from −.21 to −.64. This modified oblique model provided a statistically significant improvement in fit in all conditions, all χ^2s(3) > 3.9, all *p*s < .05. This model provided the best-fitting model in the failure condition, in which it yielded an improvement in fit of .20 over the orthogonal three-factor model as assessed by the Bentler and Bonett (1980) Δ index. In the success condition, however, modification indexes suggested the addition of Items 1 and 8 on the Stability factor and Item 4 on the Locus factor. This final (fourth) model yielded the best fit for the success condition, providing a .16 improvement over the orthogonal three-factor model on the Δ index. The best-fitting model for the overall sample included all parameters of the failure and success models, providing a .21 improvement in fit over the orthogonal three-factor model.

The factor loadings for the final solution in each condition are shown in Table 3. One can see that loadings of the Locus and Stability factors are relatively high, much higher than those of the Control factor. All final solutions also show the nonnegligible correlations between the Locus and Control factors (between .43 and .52), and between the Locus and Stability factors (between .19 and .27) needed in the factor structure to provide an adequate fit of the data.

Inspection of Tables 2 and 3 reveals that the causal structure of the CDS may not be equivalent for the success and failure samples. To provide a test of this hypothesis, a multigroup confirmatory covariance structure analysis (e.g., Bentler, 1978) was applied to the data using the LISREL procedure. This analysis compares different factor models in which data from the two groups are considered simultaneously (Jöreskog, 1971). A model in which the final "failure" model was hypothesized to represent an adequate solution for both the success and failure samples was first estimated. This model was compared with the final models independently obtained previously for each of the success and failure samples. Results of this analysis are summarized in Table 4.

Results showed that the model with different factor structures for the two groups yielded a significant improvement in fit over the model postulating identical factor structures, $\chi^2(3) = 38.3$, $p < .001$. Finally, an estimation of the model in which both groups had the factor structure of the final "success" model showed that the three cross-loadings representing the difference between failure and success solutions were nonsignificant (*t* values < 2) in the failure condition but significant in the success condition. It was found that the three additional loadings that were part of the CDS factor structure in the success condition were not part of the factor structure in the failure condition.

[2] A full oblique model was also estimated. However, results showed that the stability–control correlation was nonsignificant. Therefore, the present oblique model only involves relations between the Locus factor with the other two factors.

Table 2
Chi-Square Values From the Confirmatory Factor Analyses, and Comparisons of Improvement in Fit in the Various Models as a Function of Conditions

	Condition								
	Success			Failure			Overall		
Model	χ^2	*df*	Δ	χ^2	*df*	Δ	χ^2	*df*	Δ
1. Null	386.6***	36		256.9***	36		598.5***	36	
2. Three-factor orthogonal	105.1***	27	.73	98.3***	27	.62	154.1***	27	.74
3. Three-factor oblique (involving the Locus factor correlated with the other two factors)	86.3***	25	.78	85.2***	25	.67	121.5***	25	.80
4. Model 3 (plus Item 5 loading on the Control factor)	82.4***	24	.79	47.2***	24	.82	80.6***	24	.87
5. Model 4 (plus Items 1, locus, and 8, control, loading on the Stability factor, and Item 4, stability, loading on the Locus factor)	44.1**	21	.89	—	—	—	33.5*	21	.95
Comparison									
Model 2 vs. 1	281.5***	9	.73	158.6***	9	.62	444.4***	9	.74
Model 3 vs. 2	18.8***	2	.05	13.1**	2	.05	32.6***	2	.06
Model 4 vs. 3	3.9*	1	.01	38.0***	1	.15	40.9***	1	.07
Model 5 vs. 4	38.3***	3	.10	—	—	—	47.1***	3	.08

Note. Δ = incremental fit index (Bentler & Bonett, 1980).
* $p < .05$. ** $p < .01$. *** $p < .001$.

These findings reinforce the view that the success and failure conditions possess significantly different CDS factor structures.

Test of the Self-Serving Bias

Finally, in order to test for the self-serving bias reported by Russell (1982), the CDS data of the success and failure groups were compared with a multivariate test (Hotelling's T^2) followed by univariate *F* tests. Means and standard deviations for the CDS subscale total scores appear at the bottom of Table 3. Results replicated Russell's findings. The multivariate test was highly significant, $F(3, 241) = 17.1, p < .001$. The univariate *F* tests showed that the success and failure groups were significantly different on the Stability, $F(1, 243) = 28.4, p < .001$, and Control subscales, $F(1, 243) = 22.4, p < .001$. In line with Russell, the effect for Locus was only marginally significant, $F(1, 243) = 2.8, p < .10$. Overall, these findings reveal that attributions were perceived as being more stable, controllable, and somewhat more internal in the success than in the failure conditions.

Discussion

The present results have important implications for the CDS, attribution theory and research, and methodological procedures involved in scale validation. We discuss each of these topics in turn.

On the Reliability and Validity of the Causal Dimension Scale

With respect to the CDS itself, reliability estimates of the Locus and Stability subscales indicate that these scales are formed by homogeneous items. However, the low alpha values of the Control subscale are worth noting. Recent studies by McAuley and Gross (1983) and by Russell et al. (1987), which have used the CDS in the field settings of sport and education, respectively, also reported low alpha values for the Control subscale (.52 and .51, respectively). Thus, it appears that the Control subscale is not made up of homogeneous items. Inspection of the items composing the scale (see Table 3) reveals that they pertain to different aspects of control. More specifically, items deal with controllability (Item 7), intentionality (Item 8), and responsibility (Item 9). It is not clear if these items relate to the same type of construct intended by Weiner (1979); indeed, they may not. Consider the following:

> Of particular importance is a differentiation between the concepts of controllability and intentionality. An individual might state, for example, I intend not to drink; but I can't seem to control my behavior. Furthermore, negligence involves an unintentional action that is perceived by others as controllable. Finally, intentionality, but not controllability, implies desire or want. The above points suggest that intentionality differs from controllability. (Weiner, 1980, p. 357)

Thus, although related, concepts of controllability, intentionality, and responsibility may not be directly equivalent. This dis-

Table 3
Factor Loadings From the Confirmatory Factor Analyses' Final Models as a Function of Conditions

	Condition								
	Success			Failure			Overall sample		
Subscale/item	1	2	3	1	2	3	1	2	3
1. Locus									
An aspect of yourself/others	.63	.29		.65			.63	.21	
Inside/outside of you	.87			.77			.81		
Something about you/others	.89			.76			.81		
2. Stability									
Permanent/temporary	.23	.67			.61		.19	.66	
Changeable/unchanging		.71	−.21		.56	−.64		.66	−.43
Variable/stable over time		.80			.50			.72	
3. Control									
Controllable/uncontrollable			.60			.64			.71
Intended/unintended		.45	.47			.31		.35	.37
No one/someone is responsible			.52			.32			.40
Internal consistency (standardized)	.85	.78	.53	.77	.60	.42	.80	.73	.50
CDS mean total scores	18.7	11.5	19.2	17.5	8.3	16.3	18.0	9.7	17.6
SD	5.1	5.4	4.3	5.3	3.8	4.9	5.2	4.9	4.8

Note. Loadings of items hypothesized to load on the specific subscales are underlined; "unhypothesized items" are not. Correlations between Factors 1 and 2 for the success, failure, and overall conditions are respectively .27, .25, and .19. Correlations between Factors 1 and 3 for the same three conditions are respectively .47, .52, and .43. Factors 2 and 3 are basically orthogonal. All reported loadings are significant. CDS = Causal Dimension Scale.

tinction in meaning may not have influenced the alpha value of the Control subscale in Russell's (1982, Experiment 2) study, possibly because the methodology involved a factorial design in which causes thought to represent extremities of the three dimensions were manipulated. This probably enhanced shared variance among the control items. However, in real-life situations such as the present one, causes are not manipulated, therefore reducing the shared variance among items and allowing for differences in meaning among items to come out. Thus, although results from the Russell study showed an adequate alpha value for the Control subscale, this value may have been inflated because of the methodology used. Values of the Control subscale in the field are likely to be much lower than those reported by Russell. Future work should, therefore, concentrate on the formulation of a more homogeneous scale. Because the Control subscale is intended to measure Weiner's dimension of controllability, we suggest that items pertaining to responsibility and intentionality be replaced by other items more closely related to the concept postulated by Weiner.

Results of the confirmatory factor analyses shed new light on the CDS factor structure. Specifically, results from the factor analyses confirmed the scale's three-factor structure. These findings underscore the fact that concepts of locus, stability, and control are represented by each specific subscale. The three-factor orthogonal model obtained by Russell (1982) in his validation study represented an important improvement in fit over the null model. However, it should be made clear that it did not account well for the data, and obliqueness had to be incorporated in the factor structure. Although allowing for obliqueness among the factors improved the model's fit, a satisfactory goodness-of-fit index was obtained only when cross-loadings were incorporated in the model. In fact, a three-factor modified oblique model (with a stability item loading on the Control factor) represented a practical and significant improvement over the orthogonal model (Δ between .06 and .21) in all conditions. It should be underscored that the pattern of cross-loadings obtained in this study is by no means perceived as being definitive. Future research is needed to assess the replicability of this cross-loading pattern.

The obliqueness between factors was largely due to the important correlations between the Locus and Control factors (*r*s between .45 and .52). This rather strong relation between the two subscales suggests that control was perceived as being internal in nature. Obviously, the strength of the correlation between locus and control can be influenced by several variables such as the nature of the attribution being dimensionally assessed and

Table 4
Chi-Square Values and Improvements in Fit in the LISREL Multigroup Analysis Involving the Success and Failure Samples

Model	χ^2	*df*	Δ
1. Null	643.5*	72	—
2. Failure factor structure in both success and failure samples	129.6*	48	.80
3. Two independent factor structures	91.3*	45	.86
Comparison			
Model 2 vs. 1	513.9*	24	.80
Model 3 vs. 2	38.3*	3	.06

Note. Δ = incremental fit index (Bentler & Bonett, 1980).
* $p < .001$.

the setting itself. However, other researchers in various settings have obtained similar relations between the Locus and Control subscales. For instance, Folkes (1984) reported a correlation of .94, and Russell et al. (1987) reported a similar relation (r = .93) between the two subscales. It is important to note that in the Russell et al. (1987) study, this high correlation between locus and control was obtained at the latent variable level with the CDS and other dimensional measures. Therefore, it would appear that such an intimate relation between the two constructs is not the reflection of the CDS structure, but may be an indication that control only exists when the locus of causality is internal (indeed, it may be rather difficult to be "in control" if the cause of one's behavior is external). If it is the case that the locus and control constructs are closely related, then further modifications on the control subscale may be warranted.

In order to be fully orthogonal to the other two subscales, the Control subscale is phrased in such a way that the perspective of control is unspecified.[3] That is, the internal and external perspectives of control are confounded. For instance, Item 7 reads as follows: "Is the cause: Controllable by *you or other people*/ Uncontrollable by *you or other people*." Although this methodological procedure might be justified in order to preserve the orthogonality among the three subscales, it might lead to undesirable consequences on subjects' answers. Some subjects may focus on the internal perspective, whereas others may focus on the external perspective, and still others on both. These different focuses might lead to different control assessments of the same cause. This problematic state of affairs might partially explain the low internal consistency of the Control subscale discussed earlier. It would appear important, as some authors (e.g., Wong & Sproule, 1984) have suggested, that the perspective of control be specified. The rather high and positive correlations between these two subscales obtained in this and other studies (e.g., Folkes, 1984; Russell et al., 1987) suggest that, in general, subjects focus on the internal perspective when filling out the control items. These findings imply that the control items could be rephrased with an internal focus only. Although Russell (1982) had unsuccessfully tried to assess control in such a fashion, certain researchers have recently assessed control from the internal perspective with some success. For instance, in their study, Forsyth and McMillan (1981) operationally defined the control dimension as the extent to which an outcome is "caused by things *you* can't control versus can control" (p. 396). Similarly, Sobol and Earn (1983) defined the endpoints of the control dimension by the following statements: "*I* can do something about what other kids say about me" and "*I* can do nothing about what other kids say about me" (p. 5; see also Sobol & Earn, in press). Although such a procedure would eliminate conceptual orthogonality among the three scales, it would certainly lead to a clearer perspective on the control issue, and one that would appear to be ecologically valid.

Another possibility would be to separate out the internal and external control perspectives and to create two independent control subscales (one internal and one external). This procedure would also yield more clarity on the control issue, and it would allow one to test the nature of the relation between the locus and internal and external control dimensions. Other alternatives might be possible. Whatever solution is selected, it appears clear that future work is needed on the Control subscale in order to clarify points addressed earlier on the notion of perspective. To simply add new items to the scale (Russell et al., 1987) will not alleviate this important problem.

Implications for Attribution Theory and Research

The findings of this study also have important implications for attribution theory and research. From a theoretical perspective, results showing that the three subscales—especially Locus and Control—are correlated lead to the interesting suggestion that causal dimensions may be normally correlated in real-life settings. Anderson (1983) and Michela et al. (1982) also found support for this assumption in achievement and social situations. These findings run contrary to Weiner's (1979, 1985a) attributional theory of achievement motivation, which postulates that the three dimensions are orthogonal to one another.

Weiner (1985a) has recently addressed the question of orthogonality of dimensions. He suggested that in different real-life situations, causal dimensions may indeed be correlated. This can be due to a host of reasons, choice of the cause being one—traits, for example, are likely to be perceived as internal and stable. More important, however, according to Weiner, a failure of orthogonality at the empirical level does not invalidate separation at the conceptual level. He gives the example of height and weight. Both are highly correlated at the empirical level. Yet, they remain distinct entities. Thus, the distinction between certain causal dimensions might be justifiable at the conceptual level, if not at the empirical level.

Although Weiner's cogent analysis on the distinction between empirical and conceptual orthogonality is important, a few questions nevertheless remain. For instance, Weiner's theory being one of subjective perception, an important question is "Can dimensions that are never used (not perceived by the individual or not distinguished from other dimensions) at the empirical level be useful at the theoretical level?"; and more specifically, as pertains to Weiner's theory, "Does the external locus/controllable cell exist at the empirical level and what is its usefulness in theory if it does not?" Finally, "What is the implication for Weiner's theory if orthogonality is proven to be untenable at both the empirical and conceptual levels?" Future research is definitely needed in order to answer these and other important questions on the orthogonality of causal dimensions.

Another interesting finding that deserves mention is the fact that models postulated in the success condition proved to be less adequate than those postulated in the failure condition. Indeed, results of the analyses showed that four cross-loadings had to be incorporated in the CDS factor structure in the success condition in order to obtain an acceptable fit, whereas only one was added in the failure condition. These differences were found to be significant in the multigroup confirmatory factor analyses. Although such different factor structures might be attributed to different causes being dimensionally assessed in success and failure conditions, it should be pointed out that these findings are in line with those of various researchers (e.g., Wong & Weiner, 1981) who show that people are more prone to make

[3] We would like to thank an anonymous reviewer for this insightful suggestion.

attributions in failure than in success conditions (see Weiner, 1985b, for a review on "spontaneous" attributions). That people are less likely to spontaneously make attributions in success situations suggests that several individuals in such situations may not make attributions at all (cf. Dweck & Goetz, 1978). When asked to fill out scales such as the CDS, they may select attributions that are artificial in nature, thus rendering the task of coding causal dimensions in those situations rather difficult. This state of affairs may lead to a somewhat more cumbersome dimensional structure in success than in failure situations. On the other hand, it just might be that the dimensional structure is naturally more complex in success than in failure situations. In any event, there are no reasons to believe that causal dimensions used in field settings are equivalent for success and failure situations. It would therefore appear important that future research take into consideration the success and failure distinction in assessing causal dimensions.

Results of this study also have important implications for an interesting attributional phenomenon called the *self-serving* (or hedonic) *bias* (e.g., Zuckerman, 1979). This phenomenon is said to be in operation when subjects make more internal attributions in success than in failure conditions, but more external attributions in failure than in success conditions. Thus, people take credit for success but deny responsibility for failure outcomes. Note that in such studies, only internal and external "raw" attributions have been typically used. More recently, Russell (1982) has shown that a similar bias seems to exist at the dimensional level. He showed that attributions for success are perceived as being more stable, controllable, and somewhat more internal than are attributions for failure. Results of the present study replicated the findings of Russell. Specifically, results of the multivariate and univariate analyses of variance demonstrated that subjects perceived attributions as being more internal, stable, and controllable in the success than in the failure condition. Worthy of note is that, in line with Russell, the effects were highly significant for both the Stability and Control subscales but less so ($p < .10$) for the Locus subscale. McAuley and Gross (1983) have also obtained similar results. Furthermore, in two recent field studies conducted in the realm of sports, Mark, Mutrie, Brooks, and Harris (1984) reported significant effects for the Stability and Control subscales, but none for Locus. Taken as a whole, these findings suggest that once other dimensions (stability and control) are considered, locus may lose some of its heuristic properties as pertains to the self-serving bias. Future research on this issue would appear promising.

Implications for Scale Validation Procedures

Finally, the present results also have implications for methodological procedures involved in scale validation. Results clearly showed the importance of using *confirmatory* factor analysis in lieu of *exploratory* factor analysis to validate a scale. Results of this study with confirmatory analysis lead to different results than those reported by Russell (1982) with exploratory factor analysis. Clearly confirmatory analysis represents a more accurate test of the underlying structure of a scale than does exploratory factor analysis. For this reason, it is suggested that confirmatory analysis be used in future work on scale validation whenever possible (see also Paulhus, 1983, on this issue).

The importance of assessing the scale factor structure within success and failure was also shown. An analysis across conditions (e.g., the overall condition in this study) may hide some interesting and important differences in factor structure due to conditions. For instance, results of the multigroup confirmatory analyses revealed that the success and failure conditions were significantly different. A higher number of cross-loadings were necessary in the success condition than in the failure condition in order to obtain an adequate fit. Thus, assessing an attributional scale factor structure must be done independently for the success and failure conditions; if not, important information may be lost in the process.

The present findings also underscored the importance of validating scales in real-life settings. Although imaginary or hypothetical scenarios may be used effectively as a first step in scale validation, it should be clear that such a methodology may not be equivalent to that involving important and meaningful field situations. Therefore, it is suggested that validation methodology of scales dealing with subjects' phenomenological perception of events (such as the CDS) includes a process in which scale validity is assessed in real-life settings. Indeed, if an instrument is to be used in different settings, it should be shown to be ecologically valid in these various settings.

In sum, recent research in the attribution domain clearly indicates that there is a definite need for an instrument that assesses people's perceptions of causal dimensions. Such research also suggests that the CDS fares better than other measurement devices in assessing causal dimensions (e.g., Russell et al., 1987). In line with such findings, results of this study provided some support for the validity and reliability of the CDS in a field setting. However, certain refinements on the scale are deemed necessary. It is therefore suggested that future research be conducted on the scale. Such work should concentrate on improving the reliability of the Control subscale, as well as resolving the issue of this subscale's perspective.

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