Measuring Causal Attributions: The Revised Causal Dimension Scale (CDSII)

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Although attribution theory continues to be a fertile area of social psychological research, much of the extant literature has suffered from questionable measurement of the constructs of interest. This is especially true in the case of assigning causal attributions placement in theorized dimensional space. Russell's (1982) Causal Dimension Scale represented an important development toward more precise measurement of causal dimensions; however, it has been criticized on a number of fronts. The present report presents the rationale for and initial psychometric properties of a revised version of the scale, the CDSII. Employing data from four studies, a confirmatory factor analysis is reported examining the goodness of fit of the hypothesized four factor oblique structure to the data. The results are discussed in terms of possible applications of the CDSII and the need for further validity testing.

Weiner's (1985, 1986) attributional model of achievement motivation and emotion has evolved over the past 20 years as an influential theory in social psychology. Causal attributions have been identified as playing an important role in such diverse behaviors as interpersonal relations (Fincham, Bradbury, & Grych, 1990), sport and physical activity (McAuley & Duncan, 1990a), international conflict (Betancourt, 1990), and health behaviors (Lewis & Daltroy, 1990; Michela & Wood, 1986). Weiner's (1985) model posits causal attributions to be of little importance in themselves but, rather, to influence behavior in terms of the causal dimensions or common properties underlying attributions. It is theorized that the effects of causal dimensions on behavior are mediated by future expectations and emotional reactions to achievement outcomes (Weiner, 1985).

As considerable importance is placed on causal dimensions in the attribution-behavior link, it is of paramount importance that we accurately measure these properties theorized to underlie causal attributions. Evidence has been generated to support the existence of three causal dimensions, termed locus of causality, stability, and control (Weiner, 1985). The locus of causality concerns whether the cause resides within or is external to the attributor, whereas the stability dimension refers to whether the cause is invariant or changeable over time. Finally, the control dimension reflects whether the cause is controllable or uncontrollable. In traditional approaches to assessing causal dimensions, researchers have, for the most part, simply translated the causal attributions made for an achievement outcome into causal dimensions, committing what Russell (1982) has called "the fundamental attribution researcher error" (i.e., making the assumption that the researcher perceives causes in the same way as the respondent). In a more appropriate methodology, the respondent would directly indicate how he or she views the attribution in terms of the causal dimensions (Russell, 1982; Russell, McAuley, & Tarico, 1987; Weiner, 1983).

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To overcome the problems inherent in traditional approaches to attribution measurement, Russell (1982) developed the Causal Dimension Scale (CDS) as a measure of how individuals perceive causes. Using the CDS, the respondent codes the causal attribution along a series of semantic differential scales representing the dimensions of locus of causality, stability, and control. In addition to Russell's (1982) original presentation of the psychometric properties of the CDS, a number of studies have provided varying degrees of support for the reliability and validity of this scale (Abraham, 1985; Dobbins, 1985; Folkes, 1984; Mark, Mutrie, Brooks, & Harris, 1984; McAuley & Gross, 1983; McAuley, Russell, & Gross, 1983; Russell & McAuley, 1986; Vallerand, 1987; Wilson & Linville, 1985). In addition, Russell et al. (1987) have provided multitrait-multimethod evidence to support the CDS as being superior to other commonly used methods of assessing causal dimensions.

Despite this confirmation of the psychometric properties of the CDS, a number of researchers (e.g., McAuley & Gross, 1983; Russell et al., 1987; Vallerand & Richer, 1988) have raised serious concerns regarding the structure of the scale, particularly the controllability dimension. For example, both McAuley and Gross (1983) and Russell et al. (1987) expressed concern about the low internal consistency of the control dimension and its propensity to correlate highly with the locus of causality dimension. Certainly, the issue of low reliability is a serious one, and the discriminant validity of the control scale can be questioned on the basis of its generally high correlation with the locus of causality subscale. Other attribution researchers have also discussed the confounding or high interrelatedness of attributional dimensions. Anderson (1983; Anderson & Arnoult, 1985a) has argued that the distinction among dimensions should be considered in terms of logical versus empirical orthogonality and has experimentally demonstrated the empirical relatedness of causal dimensions (Anderson & Arnoult, 1985b). Although failure to demonstrate orthogonality at the empirical level does not necessarily rule out separation at the conceptual level (Anderson, 1983), it does appear that these weaknesses need to be addressed.

Vallerand and Richer (1988) have challenged the adequacy of the CDS factor structure on the grounds that it has not been subjected to confirmatory factor analysis, thereby questioning the scale's construct validity. Employing the CDS, Vallerand and Richer (1988) assessed students' attributions for success and failure immediately following the announcement of grades on a midterm examination. The factor structure of the CDS was then evaluated using confirmatory factor analyses. Model comparisons included the initially hypothesized three-factor orthogonal solution versus (a) a null model, (b) a three-factor model allowing correlations between the three factors, and (c) two other models allowing the loading of items on dimensions other than those originally hypothesized (i.e., cross-loadings). Although the three-factor orthogonal model presented by Russell (1982) fit the data well, the models allowing cross-loading of items presented significant improvements in fit over the original model.

With respect to the internal consistency of the control dimension, Vallerand and Richer (1988) report values of coefficient alpha below .50 for that dimension. In discussing this problem, they raise the question of the homogeneity of the three items that constitute the control dimension. Indeed, these items appear not to be equivalent but, rather, to represent three related but distinct constructs: control, responsibility, and intentionality. Vallerand and Richer (1988) suggested that earlier reports regarding the internal consistency of this dimension (Russell, 1982) may have been inflated because of the methodology used. Others have also suggested that the items constituting the control dimension lack homogeneity (McAuley & Gross, 1983; Russell et al., 1987).

There remains, however, an additional problem with the control scale. It concerns the wording of the scale items, which are designed to reflect a cause that is "controllable by you or other people" at one pole and "uncontrollable by you or other people" at the other pole. Such terminology could produce dimensional placement that runs counter to the respondent's perception. For example, if a student fails an exam because the instructor advised the student to read the wrong study guide, the cause of failure could be perceived as being either under the control of the instructor or uncontrollable by the respondent, depending on which is the more salient cause. However, the response structure of the CDS makes it impossible to place the cause accurately along the control dimension, because it has too few options. The cause is merely controllable or uncontrollable. We would argue that control should be further differentiated in terms of whether the cause is (a) controllable or uncontrollable by the person and (b) controllable or uncontrollable by other people. In essence, the CDS should evaluate personal control and external control as separate but related dimensions underlying attributions.

Furthermore, Anderson and Arnoult (1985a) have made quite compelling arguments that personal control is the most important causal dimension. In a study examining the relationships among causal dimensions and interpersonal relations, Anderson and Arnoult (1985b) consistently demonstrated the superiority of the control dimension over other dimensions, including a combination of all the dimensions within the reformulated learned-helplessness model of depression (Abramson, Seligman, & Teasdale, 1978), in explaining variation in depression, shyness, and loneliness. However, both personal and external control may have important implications for future behavior, depending on which is the more salient factor under the circumstances.

For illustrative purposes, consider professional baseball. Frequent occurrences of altercations involving pitchers and batters have led to several widely reported bench-clearing brawls. Whose fault is this? If the batter has unexpectedly hit a home run off a pitcher and is greeted at his next at-bat by a pitch that hits flesh instead of the strike zone, the batter is likely to attribute his pain to an externally controllable cause (i.e., a dangerous pitch delivered by a vindictive and punitive pitcher). However, if the batter makes the error of leaning or stepping into the strike zone and is hit by a perfectly legitimate pitch, the cause can be attributed as personally controllable (i.e., incorrect or careless stance). In these two cases, the outcomes may be very different. Anger and aggression result from the former causal explanation, whereas feelings of anxiety, incompetence, and inadequacy may result from the latter explanation. Moreover, the distinction between these aspects of control coupled with the lack of homogeneity among the original control items of the CDS would suggest that the original control dimension was multidimensional, thereby accounting for the low reliabilities reported in the literature. At any rate, the verbal anchors of the control scale in the CDS are currently inadequate, allowing for a restricted and possibly confusing assessment of controllable versus uncontrollable causes.

With these concerns in mind, we sought to revise the CDS in such a way as to reduce the psychometric problems associated with the control dimension. In so doing, the locus of causality and stability subscale items remain unchanged. Four studies are reported in diverse situations that detail the reliability and construct (factorial) validity of a revised version of the CDS, hereinafter referred to as the CDSII. Each study follows a similar pattern in which subjects make attributions for outcomes or performance in four settings: a midterm examination, a one-on-one basketball game, motor performance in a laboratory exercise test, and performance of a graded gymnastics routine. These settings cover both laboratory and real-world arenas, in which the outcome of the midterm examination and gymnastic routine contributed to students' final grade. Employing data from across the four studies, confirmatory factor analyses were conducted to determine the validity of the proposed factor structure of the CDSII. Internal consistency across samples was determined using coefficient alpha.

METHOD

This section briefly details the characteristics of the subjects and general procedures for each of the studies separately. In the case of Studies 2, 3, and 4, greater detail can be found elsewhere (McAuley & Duncan, 1989, 1990b; McAuley & Tammen, 1989).

Study 1

In the first study, 144 undergraduate students (74 males, 70 females) participated as partial fulfillment of an introductory psychology course requirement. After receiving the results of their midterm examination in psychology, subjects completed a questionnaire on which they indicated how well they thought they had performed on the examination and then made an open-ended causal attribution for their performance. Subjects coded that attribution in terms of items representing locus of causality, stability, personal control, and external control. As indicated earlier, the locus and stability measures consisted of three items each from the original CDS (Russell, 1982). The personal and external control items included the original three control items from Russell's (1982) CDS as well as five new items for each dimension, reflecting various aspects of control. Each of the new items was worded to reflect personal control (e.g., "Is the cause something you can/cannot regulate?") and external control (e.g., "Is the cause something other people can/cannot regulate?").

Study 2

The second study was conducted in a laboratory exercise setting in which subjects were randomly assigned to one of two expectancy-disconfirming conditions, high expectancy/failure outcome or low expectancy/success outcome. A more detailed account of the procedures can be found elsewhere (McAuley & Duncan, 1989).

Fifty-five male and female undergraduate students participated as subjects in this study. Once assigned to a condition, subjects participated in a competitive bicycle ergometer task in which the outcome was manipulated and bogus feedback provided to participants. At the end of three competitive trials, subjects completed the CDSII.

Study 3

The third study assessed causal attributions following performance of a gymnastic routine (see McAuley & Duncan, 1990b, for procedural details). College students (32 males, 49 females) enrolled in gymnastic activity classes volunteered as subjects for this study. The routine was a required assignment; each student was responsible for composing the routine along guidelines provided by the instructor and then performing the routine under

TABLE 1: Revised Causal Dimension Scale (CDSII)

Instructions: Think about the reason or reasons you have written above. The items below concern your impressions or opinions of this cause or causes of your performance. Circle one number for each of the following questions.

Is the cause(s) something:										
1. That reflects an aspect of yourself	9	8	7	6	5	4	3	2	1	reflects an aspect of the situation
2. Manageable by you	9	8	7	6	5	4	3	2	1	not manageable by you
3. Permanent	9	8	7	6	5	4	3	2	1	temporary
4. You can regulate	9	8	7	6	5	4	3	2	1	you cannot regulate
5. Over which others have control	9	8	7	6	5	4	3	2	1	over which others have no control
6. Inside of you	9	8	7	6	5	4	3	2	1	outside of you
7. Stable over time	9	8	7	6	5	4	3	2	1	variable over time
8. Under the power of other people	9	8	7	6	5	4	3	2	1	not under the power of other people
9. Something about you	9	8	7	6	5	4	3	2	1	something about others
10. Over which you have power	9	8	7	6	5	4	3	2	1	over which you have no power
11. Unchangeable	9	8	7	6	5	4	3	2	1	changeable
12. Other people can regulate	9	8	7	6	5	4	3	2	1	other people cannot regulate

NOTE: The total scores for each dimension are obtained by summing the items, as follows:
1, 6, 9 = locus of causality; 5, 8, 12 = external control; 3, 7, 11 = stability; 2, 4, 10 = personal control.

the scrutiny of the instructor and the class. On completing the routine, each subject was asked to indicate how well he or she had performed, to identify a causal attribution for that performance, and then to code the attribution along causal dimensions using the CDSII.

Study 4

The final study assessed causal attributions following participation in a competitive one-on-one basketball-shooting game. Male (n = 80) and female (n = 36) undergraduate students volunteered as participants in the study. Following the outcome of the contest, subjects were asked to identify the primary cause of their winning or losing and then to code that cause along causal dimensions using the CDSII.

RESULTS

Item Selection

The authors generated a series of items as representing various aspects of the control construct. Ten items (five each) were agreed on as being representative of personal control and external control. The three control items from the original CDS (Russell, 1982) were also included in the initial analyses. Through the process of item analyses and a confirmatory factor analysis using the LISREL VII (Jõreskog & Sõrbom, 1989) computer program, the pool of new items administered to subjects in Study 1 was reduced to a total of six, three representing personal control and three representing external control. These six items, along with the other items (assessing locus of causality and stability) that make up the CDSII, are listed in Table 1. It should be noted that none of the original CDS control items loaded on the personal or external control factor, and these items were dropped for all subsequent analyses.

TABLE 2: Reliabilities for the Four Causal Dimensions

Dimension	*Study 1*	*Study 2*	*Study 3*	*Study 4*
Locus of causality	.714	.712	.659	.600
Stability	.683	.660	.681	.651
Personal control	.767	.902	.792	.715
External control	.711	.917	.820	.844

Reliability

Coefficient alpha (Cronbach, 1951) was calculated to determine the internal consistency of the four scales. All values were within the acceptable range according to Nunnally (1978), ranging from .60 to .92 across the four studies. The average internal consistencies across studies were as follows: locus of causality, 67; stability, .67; personal control, .79; external control, .82. Clearly, treating personal and external control as separate dimensions and employing more homogeneous items have served to increase the reliability of the control subscale. The reliability coefficients among the subscales are shown in Table 2.

Factor Structure of the CDSII

A confirmatory factor analysis was conducted using the LISREL VII computer program (Jõreskog & Sõrbom, 1989) to test the hypothesized factor structure of the CDSII. Maximum likelihood estimation procedures were employed to evaluate the fit of the proposed four-factor

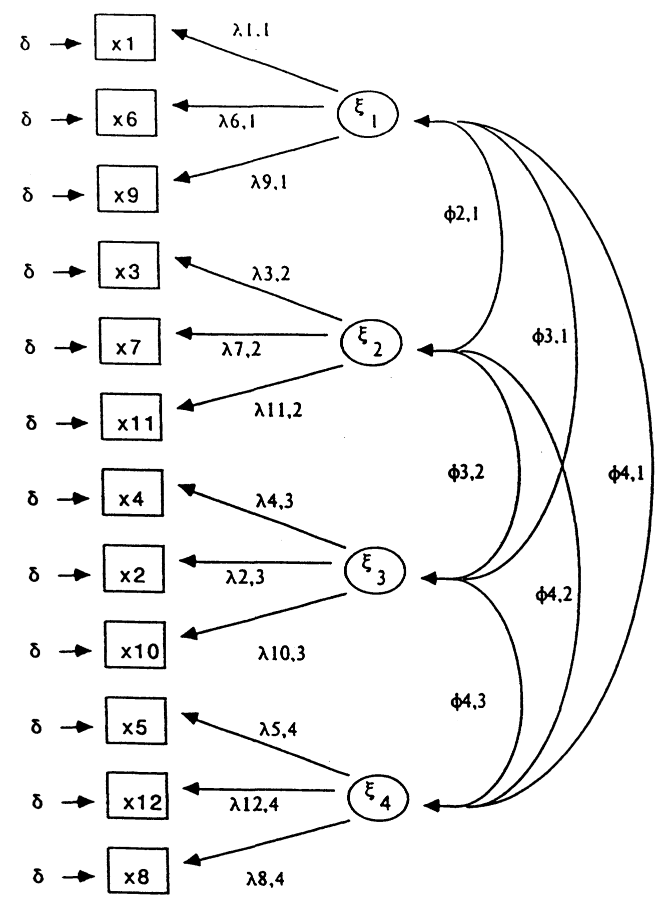

Figure 1 Parameter specifications for the 12-item four-factor CDSII. The *x* variables represent the individual items corresponding to those in Table 1.

oblique model to the data. This four-factor model is shown in Figure 1. Because the individual studies contained relatively small numbers of cases relative to the number of parameters to be estimated by the LISREL program, the confirmatory factor analysis was conducted for a combined sample of cases from the four studies ($N = 380$).

The LISREL program provides a chi-square test of the overall goodness of fit of the model, or the extent to which the hypothesized model is able to account for relations among the manifest or measured variables. Because the chi-square goodness-of-fit statistic is sensitive to sample size and, in the case of maximum likelihood estimation, violations of the assumption of multivariate normality (Jõreskog & Sõrbom, 1989), trivial differences in the residuals between the sample and reproduced covariance matrices are likely to produce a statistically significant chi-square in a model with as many variables and a sample size as large as those of the present study (Bentler, 1980; Bentler & Bonett, 1980). Consequently, evaluation of the goodness of model fit was based on considerations beyond the statistical significance of the chi-square. This involved evaluation of the goodness-of-fit index (GFI) statistic reported by LISREL VII. GFI represents the proportion of the variances and covariances of the variables being analyzed that is explained by the model (Tanaka & Huba, 1985). Thus, this statistic represents a multivariate extension of the R^2 values derived from a multiple regression analysis. Values of GFI can range between 0 and 1.0; values of .90 or greater generally indicate a model that accounts for the data well (Tanaka, 1987). A recent study by Marsh, Balla, and McDonald (1988) indicated that GFI is less affected by variations in sample size than many other indexes of model fit, and La Du and Tanaka (1989) have found that values of GFI for a given model and data were quite similar across different methods of model estimation.

TABLE 3: Loadings of the CDSII Items on the Four Factors

Item	*Locus of Causality*	*Stability*	*Personal Control*	*External Control*
1	.554	.000	.000	.000
2	.000	.000	–.741	.000
3	.000	.701	.000	.000
4	.000	.000	.764	.000
5	.000	.000	.000	–.689
6	–.747	.000	.000	.000
7	.000	–.635	.000	.000
8	.000	.000	.000	–.802
9	.632	.000	.000	.000
10	.000	.000	–.710	.000
11	.000	–.583	.000	.000
12	.000	.000	.000	–.821

NOTE: All nonzero factor loadings are statistically significant, $p < .05$. Item numbers correspond to items in Table 1. Negative loadings indicate that scoring was reversed on original responses.

The hypothesized four-factor model was found to provide an excellent fit to the data, $\chi^2(48, N = 380) = 96.85$, $p < .001$, GFI = .958. Table 3 presents the loadings of the individual items from the CDSII on the four factors corresponding to the causal dimensions. As can be seen, all these loadings were highly significant; the factors explained from 31% to 67% of the variation in responses to the individual items.

Correlations among the factors are presented in Table 4. Only the locus of causality and stability factors were uncorrelated. As would be expected, perceiving the cause as personally controllable was positively related to the locus of causality dimension, whereas perceiving the cause as externally controllable was negatively related to locus of causality. A strong negative correlation was also found between perceptions of personal and external

TABLE 4: Correlations Among the Factors

	Locus of Causality	*Stability*	*Personal Control*
Stability	.002		
Personal control	.711*	–.328*	
External control	–.646*	.156*	–.558*

*$p < .05$.

control. Personal control was associated with perceiving the cause as unstable, whereas external control was related to perceiving the cause as stable.

An issue that arises in revising the CDSII to include separate measures of personal versus external control concerns the discriminant validity of these measures relative to each other. That is, the two control scales may simply represent opposite poles of a single underlying dimension. Similarly, the discriminant validity of these two dimensions against the locus of causality dimension is an issue, because each dimension involves a pole on the locus of causality dimension. The strong correlations shown in Table 4 among these three dimensions suggest there is cause for concern regarding the discriminant validity of these scales.

To examine this issue, we conducted additional tests of the factor structure of the CDSII, combining these three dimensions to form two- and three-factor models. Specifically, we tested the following models: (a) three oblique factors (locus, stability, and a combination of personal and external control), (b) three oblique factors (stability, external control, and a combination of personal control and locus of causality), (c) three oblique factors (stability, personal control, and a combination of external control and locus of causality), and finally (d) two oblique factors (stability and a combination of personal control, external control, and locus of causality).[1] As discussed by Bentler and Bonett (1980), these latter models are nested within the original model shown in Figure 1, involving setting certain correlations among the factors at 1.0. We therefore can evaluate the effect of constraining these models relative to the fit of the model shown in Figure 1 and conduct chi-square difference tests directly comparing the fit of the original four-factor model against these nested models. Results indicating that one or more of the restricted, or constrained, models fit as well as the original model would indicate that we cannot reject the hypothesis that one or more of the four causal dimensions should be combined.

The results for these nested models are shown in Table 5. In all cases, the hypothesized four-factor model was found to provide a better fit to the data than any of the models that combined two or more of the causal dimensions into a single dimension. Therefore, we can conclude that the personal control, external control, stability, and locus of causality scales assess highly related but distinct constructs.

TABLE 5: Model Fit for the Four-Factor Model and Three Alternative Models

Model	χ^2	df	χ^2 *Difference*[a]	df[a]
Four-factor model	96.85	48	—	—
Personal and external control combined	292.26	51	195.41*	3
Locus of causality and personal control combined	181.98	51	85.13*	3
Locus of causality and external control combined	205.65	51	108.80*	3
Locus of causality, personal control, and external control combined	342.18	53	245.33*	5

a. These values represent the difference in chi-square and degrees of freedom between the nested model and the four-factor oblique model.
*$p < .001$.

In summary, the results of the confirmatory factor analyses of items from the CDSII provide support for the hypothesized four-factor oblique structure. All the items were found to load significantly on the factor corresponding to the relevant causal dimension. Although substantial correlations were found between the factors corresponding to the locus of causality, personal control, and external control dimensions, analyses of models that collapsed these factors together indicated that the four-factor model provided a significantly better fit to the data. We can conclude that, despite the correlations among these factors, the causal dimensions assessed by the CDSII represent empirically distinct constructs.

DISCUSSION

The measurement of causal attributions has been a problem plaguing much of the social psychological literature in this area. The development of the Causal Dimension Scale (Russell, 1982) provided researchers with a reliable and valid measure permitting respondents to provide open-ended causal attributions for achievement outcomes and then classify these attributions along the causal dimensions of locus of causality, stability, and control. However, a number of concerns with the CDS and with the nature of the causal dimensions, particularly control, have been voiced in the literature (e.g., Anderson & Arnoult, 1985a; McAuley & Gross, 1983; Russell et al., 1987; Vallerand & Richer, 1988). The studies reported in this article address these concerns and provide initial psychometric support to suggest that the CDSII is internally consistent and possesses adequate construct validity as a measure of how individuals perceive causes along causal dimensions.

A criticism previously leveled at the original CDS was the absence of construct (factorial) validity as evidenced by confirmatory factor-analytic evidence endorsing the scale's factor structure (Vallerand & Richer, 1988). We have attempted to be comprehensive in our attempts to provide such evidence for the revised CDSII. We conducted confirmatory factor analyses across diverse samples that suggest the hypothesized four-factor oblique structure of the measure to be tenable. It should be noted that these analyses were conducted across domains such as competition, academic examinations, physical and motor skills, and laboratory experiments. Furthermore, we tested alternative models of the dimensional structure, and the four factors, or dimensions, proved the best fit to the data.

The very heart of attribution theory is concerned with the examination of the individual respondent's phenomenology regarding the causes of events. That is, the subject is integrally involved as an active agent in the attribution process. Allowing the subject to provide an open-ended attribution for an outcome and subsequently coding that causal ascription along the causal dimensions provide a methodology that is faithful to the attribution process. As previously mentioned, the current version of the CDSII represents an attempt to address some of the weaknesses in the original CDS identified by other authors. In so doing, the assessment of perceived controllability of causal attributions has been expanded by the provision of a personal control dimension and an external control dimension.

The separation of the original control dimension into the related constructs of personal and external control expands Weiner's conceptual thinking with respect to the dimensional placement of causal attributions and is in keeping with arguments presented by Anderson and his colleagues (Anderson, 1983; Anderson & Arnoult, 1985a, 1985b). Although Weiner (1986) acknowledges the problems inherent in collapsing control by the respondent and control by other individuals into one dimension assessing "control by anyone," most researchers have been content, it seems, to ignore the possibility that the two aspects of control are conceptually distinct. This is not to say that both dimensions are always implicated in causal search. Rather, depending on the circumstances and events in question, one dimension may be more relevant than the other (Anderson & Arnoult, 1985a). Future studies are needed that examine situations or domains in which external control is particularly salient and distinguishable from personal control. It would appear that in most achievement situations personal control is likely to be perceived as most salient. However, in the case of outcomes such as health or interpersonal strife, external control may play a more prominent role.

It might also be appropriate at this juncture to consider whether we have assessed too many or too few causal dimensions. Certainly, neither we nor Weiner (1985) would suggest that locus of causality, stability, and personal and external control are the only causal dimensions. For example, the issue of globality as a dimension has been addressed by Seligman, Abramson, Semmel, and von Baeyer (1979). However, this dimension is concerned with how an individual *generally* attributes outcomes. It assesses, if you will, traitlike attributional tendencies. The CDSII, like the CDS, is a state measure assessing individual perceptions of causes in particular situations. It is certainly possible that other dimensions exist, such as intentionality and globality (Weiner, 1985). However, it was not the purpose of this endeavor to seek out more dimensions but, rather, to clarify the nature of the control dimension. Indeed, the presence of items representing dimensions other than control in all probability served to reduce the reliability of the original scale.

It might also be argued, given the covariation among the dimensions assessed by the CDSII, that there may actually be fewer than four dimensions. However, our tests of such a hypothesis through alternative nested-model comparisons using confirmatory factor analysis suggests that the four-factor model is superior to other models comprising fewer dimensions.

In conclusion, initial psychometric properties of the revised Causal Dimension Scale (CDSII) have been presented and suggest that the measure is reliable and valid across diverse domains. We have also presented data elsewhere that speak to the relationships between causal dimensions, particularly control, and affect reactions (see McAuley, 1991; McAuley & Duncan, 1990b; McAuley, Poag, Gleason, & Wraith, 1990). Further research is called for that employs the measure to test the theoretical predictions hypothesized by Weiner's (1985) attributional model of achievement motivation and emotion as well as other models of behavior in which attributions are implicated (e.g., Bandura, 1986; Locke & Latham, 1990; McAuley, 1992).

NOTE

1. An anonymous reviewer also suggested that a three-factor oblique model comprising the stability, personal control, and external control dimensions (i.e., without locus of causality) might fit the data equally well. Such a model was subsequently tested and found to fit the data less well than the four-factor model proposed ($\chi^2 = 144.55$, $p < .001$). However, because a three-factor/three-dimension model is based on a different matrix (9 × 9) than the four-dimension models (12 × 12), a

χ^2 difference test is precluded. However, comparisons using other fit measures indicate a better adjusted goodness-of-fit index, .931 (four factor) versus .85 (three factor) and superior coefficient delta, .931 (four factor) versus .90 (three factor), suggesting the proposed four-factor model to be superior.

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