Empirical Versus Theoretical Approaches to the Measurement of Coping: A Comparison Using the Ways of Coping Questionnaire and the Cybernetic Coping Scale

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Research into coping with stress at work has proliferated in recent years (Coyne & Downey, 1991; Dewe, Cox, & Ferguson, 1993; Edwards, 1988). This research has generated the need for valid and reliable measures of coping (Cohen, 1987; Endler & Parker, 1990; Latack & Havlovic, 1992; O'Driscoll & Cooper, 1994; Stone, Greenberg, Kennedy-Moore, & Newman, 1991). Numerous coping measures have been proposed (e.g., Amirkhan, 1990; Carver, Scheier, & Weintraub, 1989; Dewe & Guest, 1990; Endler & Parker, 1990; Folkman & Lazarus, 1988; Latack, 1986; McCrae, 1984; Parasuraman & Cleek, 1984), representing a wide variety of definitions and dimensionalizations of coping.

Most available coping measures have been developed and validated using one of two general approaches (Carver et al., 1989; Dewe & Guest, 1990; Parker & Endler, 1992). One approach involves assembling items from various sources (e.g., open-ended descriptions of coping episodes, existing coping measures) to represent a range of coping strategies and empirically determining the structure underlying the items, usually based on exploratory factor analyses (e.g., Amirkhan, 1990; Dewe & Guest, 1990; Endler & Parker, 1990; Folkman & Lazarus, 1988). Although items constituting such measures are often selected on conceptual grounds, this approach is essentially empirically driven, given that empirical evidence is used to determine the number of dimensions underlying the items, the assignment of items to dimensions, and based on items with high loadings, the meaning of the dimensions themselves.

An alternative approach consists of defining a set of coping dimensions *a priori,* generating or adapting items to represent each dimension, and determining empirically the extent to which each item is associated with its intended dimension (e.g., Carver et al., 1989; Edwards & Baglioni, 1993; Latack, 1986; Stone & Neale, 1984). This approach is primarily conceptually driven, in that

theory is used to generate and define coping dimensions and to assign items to each dimension prior to analysis. Although the degree to which items represent their intended dimensions has often been evaluated using exploratory factor analysis (Carver et al., 1989; Latack, 1986; Stone & Neale, 1984), some studies have employed confirmatory factor analysis (Edwards & Baglioni, 1993; Parker, Endler, & Bagby, 1993), thereby providing a more rigorous and precise evaluation of the presumed factor structure.

The relative merits of these two approaches to the measurement of coping are a source of contention in the coping literature. Dewe and Guest (1990) argue in favor of the empirical approach, based on the limited empirical support for the validity of most coping frameworks and the lack of consensus among coping researchers as to which framework is superior. In contrast, Carver et al. (1989) and Parker and Endler (1992) advocate the theoretical approach, contending that the empirical approach results in scales constructed *post hoc* that are only loosely linked to theoretical coping dimensions.

The choice between empirical versus theoretical approaches to measurement depends to some extent on the stage of development of the research domain. At early stages, relevant constructs may not be clearly delineated, and an empirical approach may be appropriate. Imposing preconceived conceptual frameworks at this stage risks omitting relevant dimensions, creating unwarranted distinctions, and generating evidence that is divorced from phenomena as they naturally occur. At later stages, alternative conceptualizations of relevant constructs have often been advanced, and a theoretical approach is needed to evaluate proposed operationalizations of each conceptualization and to test the relative merits of competing conceptualizations.

We believe that the conceptualization of coping is at a relatively mature stage, thereby

calling for a conceptual approach to the measurement of coping. Our position is supported by the substantial accumulated evidence documenting how people cope with acute and ongoing stressors (Coyne & Downey, 1991; Dewe, Cox, & Ferguson, 1993), and by the proliferation of conceptual frameworks attempting to organize this evidence (Edwards, 1988; Latack & Havlovic, 1992; Lazarus & Folkman, 1984; Silver & Wortman, 1980). Given this volume of research, we posit that the measurement of coping will be advanced not by empirically generating additional coping frameworks, but instead by comparing and evaluating frameworks that have already been proposed (Carver et al., 1989).

In addition to these conceptual considerations, there are several methodological arguments in favor of a theoretical approach to the measurement of coping. First, generating coping items without reference to a clearly defined set of *a priori* coping dimensions provides little assurance that the resulting items will represent a stable and interpretable factor structure or generate measures with adequate reliability. To achieve this, a domain-sampling procedure should be used, in which operational definitions of relevant coping dimensions are constructed and multiple items are generated to tap each dimension (Nunnally, 1978). Items generated for each coping dimension should represent alternative indicators of the dimension, as opposed to distinct facets of the dimension. Otherwise, the reliabilities of measures based on the coping dimensions are likely to suffer (Stone & Neale, 1984), and the interpretation of the measures will be ambiguous (Hattie, 1985; Wolins, 1982).

Second, empirically-driven procedures to measurement development capitalize on sampling variability and may therefore yield results that do not generalize beyond the data at hand (Campbell, 1976). This is illustrated by successive exploratory factor analyses of the Ways of Coping

Questionaire (WCQ; Folkman & Lazarus, 1988), which have yielded substantially different factor structures across samples (Parker et al., 1993; Tennen & Herzberger, 1985). These difference make it difficult to justify a single, general scoring procedure for the WCQ, which in turn inhibits the accumulation of evidence regarding a replicable set of coping dimensions.

Finally, studies adopting an empirical approach to coping measurement typically rely on exploratory factor analysis, which has several drawbacks in terms of measurement development and validation. For example, the criteria used in exploratory factor analysis to determine the number of dimensions (e.g., scree test, eigenvalues-greater-than-one rule) and to assign items to dimensions (e.g., item loadings that exceed some fixed criterion, such as .30) are arbitrary and subjective (Cudeck & O'Dell, 1994; Lambert, Wildt, & Durand, 1990). Moreover, exploratory factor analysis provides little statistical evidence regarding the correspondence between the data and the estimated factor structure, as evidenced by the overall model fit and the fit of various components of the model (e.g., the degree to which covariation among items assigned to a scale is adequately explained by their common factor). These shortcomings are overcome by methods of analysis consistent with the theoretical approach to coping measurement, most notably confirmatory factor analysis (Bollen, 1989b; Hunter & Gerbing, 1982; Long, 1983).

The purpose of this chapter is to compare empirical and theoretical approaches to the measurement of coping. To illustrate these approaches, we use the WCQ (Folkman & Lazarus, 1988) and the Cybernetic Coping Scale (CCS; Edwards & Baglioni, 1993), which represent empirical and theoretical approaches to coping measurement, respectively. First, we describe the development of these measures and review available evidence regarding their psychometric properties. We then extend the confirmatory factor analyses reported by Edwards and Baglioni

(1993) to examine the reliability, unidimensionality, and other core aspects of the construct validity of these measures, based on a sample larger than that used by Edwards and Baglioni (1993). We conclude by comparing the performance of the two measures and by providing recommendations regarding the development of coping measures, with an emphasis on the relative merits of empirical versus theoretical approaches.

Measure Origins and Development

The Ways of Coping Questionnaire

The WCQ is based on Lazarus' transactional model of stress and coping (Lazarus, 1966; Lazarus & Folkman, 1984; Lazarus & Launier, 1978). Briefly, this model views stress as a relationship between the person and the environment that taxes or exceeds the person's resources and endangers his or her well-being. Coping is defined as the "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus & Folkman, 1984, p. 141). Two basic categories of coping include efforts to alter the troubled person-environment relationship (i.e., problem-focused coping) and efforts to regulate emotional distress (i.e., emotion-focused coping). Problem-focused coping encompasses numerous specific coping strategies, such as defining the problem, generating, evaluating, and selecting potential solutions, and attempting to cognitively reappraise the situation by shifting level of aspiration, reducing ego involvement, finding alternative channels of gratification, or developing new standards of behavior. Emotion-focused coping includes strategies such as minimization, positive comparisons, seeking positive value from negative events, selective attention, distancing, avoidance, exercise, meditation, alcohol use, venting anger, and seeking emotional support.

The first version of the WCQ, labeled the Ways of Coping Checklist (WCC; Folkman & Lazarus, 1980), consisted of 68 binary items drawn from existing measures (Sidle, Moos, Adams, & Cady, 1969; Weisman & Worden, 1976) and derived from the transactional model (Lazarus & Folkman, 1984). These items were classified into two broad scales representing problem- and emotion-focused coping, based on judges' evaluations of item content (Folkman & Lazarus, 1980). However, subsequent factor analyses of these data revealed that these scales collapsed multiple coping methods (Aldwin, Folkman, Schaefer, Coyne, & Lazarus, 1980). Based on this, the two-factor conceptual structure was abandoned in favor of empirically-derived structures containing from three to eight factors (Aldwin et al., 1980; Parkes, 1984; Vingerhoets & Flohr, 1984; Vitaliano, Russo, Carr, Maiuro, & Becker, 1985). Reliability estimates for scales corresponding to these factors have averaged .77 and ranged from .56 to .91.

The current 67-item WCQ was developed by Folkman and Lazarus (1985), who deleted or reworded WCC items that were redundant or unclear, added items suggested by respondents, and changed the binary response format to a 4-point Likert scale ranging from "does not apply and/or not used" to "used a great deal." Factor analyses of the WCQ (Aldwin & Revenson, 1987; Atkinson & Violato, 1993; Folkman & Lazarus, 1985; Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986; Mishel & Sorenson, 1993; Parker et al., 1993; Smyth & Williams, 1991) have yielded four to eight factors. Scales based on these factors have exhibited reliabilities comparable to those for the WCC, averaging .73 and ranging from .56 to .85. The factor structure identified by Folkman et al. (1986) is currently advocated as the scoring protocol for the WCQ (Folkman & Lazarus, 1988).

A closer examination of successive factor analyses of the WCQ reveals that its factor

structure is rather unstable. This is partly evidenced by the varying number of factors extracted. However, solutions with the same number of factors have often placed the same items on conceptually different factors or omitted some items entirely (e.g., Aldwin & Revenson, 1987; Folkman & Lazarus, 1985; Folkman et al., 1986). This is partly attributable to the content of the WCQ items, some of which confound different coping methods (e.g., "Didn't to let it get to me; refused to think too much about it") or are inherently ambiguous, describing a coping behavior without specifying its focus or intent (e.g., "I got professional help", "I changed something about myself", "I prayed", "I did something I didn't think would work, but at least I was doing something"). This instability is also symptomatic of conducting successive exploratory factor analyses on separate samples, which may yield different results simply due to sampling variability. Such analyses provide weak evidence regarding the generalizability of a given factor structure across samples.

The Cybernetic Coping Scale

The CCS was derived from Edwards' cybernetic theory of stress, coping, and well-being (Edwards, 1988, 1992; Edwards & Cooper, 1988). This theory views stress as a discrepancy between the individual's perceived state and desired state, provided the presence of this discrepancy is considered important by the individual. The impact of this discrepancy on well-being is also moderated by duration, or the amount of time the person spends thinking about the discrepancy. Coping is conceptualized as attempts to reduce or eliminate the negative effects of stress on well-being. Five forms of coping are identified, including attempts to bring the situation into conjunction with desires, adjust desires to meet the situation (i.e., accommodation), reduce the importance associated with the discrepancy (i.e., devaluation), direct attention away from the

situation (i.e., avoidance), and improve well-being directly (i.e., symptom reduction). Hence, stress and coping are viewed as critical components of a negative feedback loop, in which stress damages well-being and activates coping, which may improve well-being directly and indirectly, through the perceived and desired states comprising the discrepancy, the level of importance associated with the discrepancy, and the amount of attention directed toward the discrepancy.

The first version of the CCS was based on items drawn from existing coping measures (e.g., Aldwin et al., 1980; Billings & Moos, 1984; Latack, 1986; Pearlin & Schooler, 1978; Sidle et al., 1969), which were substantially revised and supplemented in accordance with the five dimensions indicated by the cybernetic theory (i.e., changing the situation, accommodation, devaluation, avoidance, symptom reduction). The eight items that were considered most representative of each dimension were combined and administered to samples of MBA students, executives, and psychiatric inpatients. Three confirmatory factor analyses were performed, based on a measurement model specified by assigning each item *a priori* to its intended factor and fixing loadings on all other factors to zero. Results were similar across samples, but also indicated that certain factors were poorly represented, particularly accommodation and symptom reduction. Based on these results, additional items were written, and all items were evaluated for content and clarity by five judges, who were provided definitions of the five coping dimensions and asked to rate the degree to which each item represented its intended dimension. The eight items that best represented each dimension, based on both conceptual and statistical criteria, were retained to form the second version of the CCS, which was used in this study.

The Present Investigation

This investigation reports confirmatory factor analyses of the WCQ and CCS. These

analyses evaluate measurement models for the empirically derived eight-factor structure currently recommended to score the WCQ (Folkman et al., 1986; Folkman & Lazarus, 1988) and for the theoretically derived five-factor structure underlying the CCS. By employing confirmatory factor analysis, this study avoids shortcomings of previous studies of the WCQ based on exploratory factor analysis (Aldwin & Revenson, 1987; Atkinson & Violato, 1993; Folkman & Lazarus, 1985; Folkman et al., 1986; Mishel & Sorenson, 1993; Smyth & Williams, 1991). Moreover, this study extends previous confirmatory factor analyses of the WCQ (Parker et al., 1993) by providing a more detailed assessment of model fit, and by reporting fit indices that avoid problems with previous indices, such as susceptibility to sample size (Gerbing & Anderson, 1992). Finally, this study augments analyses reported by Edwards and Baglioni (1993) by drawing from a larger sample and using additional criteria for evaluating model fit.

Method

Sample

Surveys were distributed to 982 MBA students at a large business school in the eastern U.S. A total of 230 surveys were returned, with 181 providing usable responses on all measures. The response rate (23%) was probably limited due to the competing demands facing the students (e.g., classes, job search) and to the lack of an incentive (e.g., payment, course credit) for completing the survey. The final sample was predominantly male (67%), averaged 27 years of age (range = 22 to 34 years), and averaged 4.27 years of work experience (range = 0 to 13 years). Career intentions of respondents included consulting (21%), finance (21%), marketing (16%), production (6%), and corporate planning (6%), with the remaining 30% distributed among real estate development, human resource management, investments, sales management, systems, law, and other specific job

types indicated by the respondents. Respondents did not differ from non-respondents in terms of age, gender, or years of work experience.

Measures

Measures included the 67-item WCQ presented in Lazarus and Folkman (1984, pp. 328-333) and the 40-item second version of the CCS. Following Lazarus and Folkman (1984), a four-point response scale was used for the WCQ ("Not used" to "Used a great deal"), whereas a seven-point response scale was used for the CCS ("Did not use at all" to "Used very much"). To reduce order effects, half of the surveys presented the WCQ first, and the other half presented the CCS first. Measures were distributed near the conclusion of the recruiting season, when most respondents were near the end of their job search. For both measures, respondents were asked to indicate how they coped with problems in locating what they viewed as the ideal job. Following Folkman et al. (1986) and Folkman and Lazarus (1988), eight WCQ scales were created, representing confrontive coping (6 items), distancing (6 items), self-control (7 items), seeking social support (6 items), accepting responsibility (4 items), escape-avoidance (8 items), planful problem-solving (6 items), and positive reappraisal (7 items). Five eight-item CCS scales were constructed, representing changing the situation, accommodation, devaluation, avoidance, and symptom reduction.

Analysis

To facilitate comparisons with earlier research, initial analyses consisted of calculating reliability estimates (Cronbach's alpha) and intercorrelations among the coping scales. Next, confirmatory factor analyses were conducted, examining item loadings, residuals, modification indices, correlations among the latent factors, and overall model fit. Analyses were performed

using LISREL 8 (Joreskog & Sorbom, 1993). Criteria for assessing overall model fit included the chi-square test statistic, the goodness-of-fit index (GFI) and adjusted goodness-of-fit index (AGFI) (Joreskog & Sorbom, 1993), the Tucker-Lewis Index (TLI; Tucker & Lewis, 1973), the Incremental Fit Index (Bollen, 1989a), and the Comparative Fit Index (CFI; Bentler, 1990). Despite the widespread use of the chi-square, GFI, and AGFI for assessing overall model fit, these indices have important drawbacks, most notably their dependence on sample size (Gerbing & Anderson, 1992). The TLI, IFI, and CFI are independent of sample size, although the IFI and CFI exhibit less variance than the TLI and are therefore currently preferred as indices of fit (Gerbing & Anderson, 1992).

In addition to overall model fit, several specific aspects of the measurement models were examined. First, the magnitude and significance of each item loading on its assigned factor was assessed. The magnitude of this relationship provides a direct indication of the construct validity of the item in question (Bollen, 1989b; Schwab, 1980). Second, the product rule for internal consistency was examined by determining whether the correlation between any two items assigned to the same factor was equal to the product of their respective loadings.[1] This rule reflects the principle that, if two items represent the same construct, their relationship should be completely determined by their associations with that construct (Danes & Mann, 1984; Gerbing & Anderson, 1988). If this rule is satisfied, then the residual for the correlation between items assigned to the same factor should not differ from zero. Third, the product rule for external consistency was applied by determining whether the correlation between two items assigned to different factors was equal to the product of the item loadings times the correlation between the two factors involved. This rule embodies the notion that the relationship between two items representing different

constructs should be completely determined by the relationship between those constructs and the association of each item with its assigned construct (Danes & Mann, 1984; Gerbing & Anderson, 1988). If this rule is satisfied, then the residual for the correlation between items assigned to different factors should not differ from zero. Fourth, modification indices for item loadings on factors other than the assigned factor were examined. A significant modification index signifies that model fit would be improved if an item were allowed to load on additional factors (Sorbom, 1975). Such evidence indicates that the item in question represents the influence of multiple factors and is therefore a poor indicator of its intended factor. Finally, modification indices for correlations between item measurement errors were examined. If a measurement model is correctly specified (i.e., the hypothesized factors and their intercorrelations account for the covariation among the items), then measurement errors should be random (i.e., uncorrelated), indicating that no omitted factors induce systematic covariation between items (Gerbing & Anderson, 1984; Lord & Novick, 1968). This would be evidenced by nonsignificant modification indices for correlations between measurement errors.

Results

Reliability and Intercorrelations of the WCQ and CCS Scales

Table 1 presents reliability estimates and intercorrelations of the WCQ and CCS scales. Of the eight WCQ scales, only one (escape-avoidance) exhibited a reliability greater than .70, six ranged between .60 and .70, and one (confrontive coping) was less than .50. In contrast, all five CCS scales exhibited reliabilities greater than .70, ranging from .79 to .94. For the WCQ, the highest interscale correlation was between accepting responsibility and escape-avoidance which, based on interitem correlations, indicated a shared emphasis on putting the situation behind oneself.

For the CCS, the highest intercorrelation was between the accommodation and devaluation scales, which was attributable to two accommodation items that conveyed elements of minimizing the situation (i.e., "I told myself the situation was okay after all", "I tried to convince myself that the way things were was, in fact, acceptable"). The devaluation and avoidance scales were also highly correlated, suggesting that avoidance may be accompanied by deciding the problem is unimportant. The WCQ distancing scale was highly correlated with the CCS accommodation, devaluation, and avoidance scales. Further inspection revealed that these correlations were attributable to specific items in the distancing scale that suggested accommodation ("Looked for the silver lining, so to speak; tried to look on the bright side of things"), devaluation ("Made light of the situation; refused to get too serious about it"), and avoidance ("Tried to forget the whole thing"). The WCQ escape/avoidance scale was highly correlated with the CCS avoidance scale, which was expected due to their similar emphases. Likewise, the WCQ planful problem solving scale was highly correlated with the CCS changing the situation scale, due to a shared emphasis on directing efforts toward the situation rather than the person.

Insert Table 1 About Here

Confirmatory Factor Analyses

Standardized item loadings and fit indices are reported in Tables 2 and 3, and correlations among the latent factors obtained from a full 13-factor measurement model are reported in Table 1. Both models yielded a significant chi-square, indicating that neither model fit the data. GFI and AGFI values were .68 and .64 for the WCQ and were .71 and .67 for the CCS. Although these

values suggest that the CCS model fit slightly better than the WCQ model, none of the values approached the .90 criterion suggested by Benter and Bonnet (1980). However, as noted previously, the chi-square, GFI, and AGFI have known drawbacks (e.g., sensitivity to sample size), and indices less prone to these problems, such as the TLI, IFI, and CFI, should be examined. Values for these indices ranged from .52 to .57 for the WCQ but ranged from .82 to .83 for the CCS. This evidence indicates that the CCS model yielded substantially better fit than the WCQ model, although the fit of the CCS model remained somewhat below the .90 criterion.

Insert Table 2 About Here

Insert Table 3 About Here

Correlations among the 13 latent factors (see Table 1) paralleled those among the CCS and WCQ scales. However, the absolute magnitudes of the factor correlations were generally larger than those for the scales, due to the fact that the former are corrected for measurement error. Factor correlation for the CCS ranged from -.179 to .647, whereas factor correlations for the WCQ ranged from -.251 to .821, with four correlations exceeding .70. Although all correlations for both measures were significantly less than 1.0 ($p < .05$), thereby providing evidence for discriminant validity (Singh, 1991), the high correlations for the WCQ suggest some redundancy among its factors, particularly the distancing and self-controlling factors and the accepting responsibility and escape-avoidance factors.

As shown in Table 2, two of the eight WCQ factors contained items with nonsignificant loadings ($p > .05$), indicating that these items did not adequately represent the intended underlying factor. In contrast, all CCS items loaded significantly on the intended factor ($p < .05$; see Table 3). Tables 2 and 3 also show considerable variation in item loadings for the WCQ factors, whereas all but the accommodation factor for the CCS exhibited fairly consistent loadings. Nonetheless, tests for tau equivalence (Joreskog & Sorbom, 1988) yielded similar results for the WCQ and the CCS, in that within-factor item loadings did not significantly differ for four of the eight WCQ factors (distancing, self-controlling, accepting responsibility, escape-avoidance) and for two of the five CCS factors (avoidance, symptom reduction) factors ($p > .05$). Further inspection revealed that standard errors for item loadings were notably higher for the WCQ than for the CCS items, making it more difficult to demonstrate tau equivalence for the CCS.

Product rules for internal and external consistency were tested by examining standardized residuals. All eight WCQ factors yielded significant within-factor residuals ($p < .05$), with proportions ranging from 1/15 for planful problem-solving to 7/21 for self-controlling.[2] All eight factors also exhibited significant between-factor residuals, ranging from 47/264 for planful problem-solving to 69/264 for confrontive coping. As expected, the largest residuals were found for items sharing similar content that were assigned to different factorsm, such as items 28 ("I let my feelings out somehow") and 45 ("Talked to someone about how I was feeling") and items 40 ("Avoided being with people in general") and 43 ("Kept others from knowing how bad things were"). Like the WCQ, all five CCS scales exhibited significant within-factor residuals, ranging from 6/28 for changing the situation to 19/28 for accommodation. The residuals for the accommodation factor corresponded to several item pairs sharing specific content that was not

explained by the common underlying factor (e.g., "I tried to accept the situation as it was" and "I tried to just accept things as they were"). All five CCS factors also exhibited significant between-factor residuals, ranging from 39/256 for changing the situation to 75/256 for accommodation. Again, these residuals represented items with similar content assigned to different factors, such as items 6 ("I told myself the situation was okay after all") and 20 ("I told myself the problem wasn't so serious after all"). In total, of the 1225 residuals tested for the WCQ, 276 were significant (22.5%), whereas 184 of the 780 residuals tested for the CCS were significant (23.6%).

Overall, 40 of the 50 WCQ items yielded significant modification indices ($p < .05$) for loadings on at least one other factor, 26 items yielded significant modification indices on three or more factors, and 6 items yielded significant modification indices on five factors. For example, items 62 ("I went over in my mind what I would say or do") and 63 ("I thought about how a person I admire would handle the situation and used that as a model") not only loaded on the self-controlling factor, but also yielded significant modification indices for the confrontive coping, distancing, social support, planful problem-solving, and positive reappraisal factors. This apparently reflects the inherent ambiguity of these items, which do not specify the content of what was mentally rehearsed or how the admmired person would handle the situation. In contrast, 17 of the 40 CCS items yielded significant modification indices for other factors, with five items yielding significant modification indices on three factors. Again, items with a larger number of significant modification indices were stated in more ambiguous terms (e.g., item 22, "I tried to change the things about the situation that were bothering me").

For both models, modification indices for within-factor measurement error correlations corresponded closely to the within-factor residuals, meaning that nearly every item pair that yielded

a significant residual also produced a significant modification index ($p < .05$). This is not surprising, because the residual between any within-factor item pair can be eliminated by allowing their measurement errors to correlate. All eight WCQ factors yielded significant modification indices for between-factor correlated errors, ranging from 18/264 for planful problem-solving to 30/184 for accepting responsibilitiy. For the CCS, significant modification indices were found for all five factors, ranging from 20/256 for avoidance to 26/256 for changing the situation and symptom reduction. Although not identical, these results paralleled the pattern of residuals for both models, such that a significant modification index was usually accompanied by a significant residual.

Discussion

The results of the preceding analyses provide little support for the validity of the WCQ but provide moderate to strong support for the validity of the CCS. Reliability estimates for the WCQ scales ranged from .49 to .73, with only one exceeding .70, whereas reliabilities for the CCS scales ranged from .79 to .94. The measurement model for the WCQ provided a poor fit to the data, and two of the eight factors contained items with nonsignificant loadings. In contrast, the CCS yielded substantially better fit, and all item loadings were significant and, for the most part, large in magnitude. Furthermore, significant modification indices for item loadings on other than the assigned factor were obtained for 80% of the WCQ items but for only 43% of the CCS items.

Other evidence provided comparable support for the WCQ and the CCS. In particular, product rules for internal and external consistency for the WCQ were satisfied in 79.3% and 77.3% of the test performed, respectively. For the CCS, the product rule for internal consistency was satisfied for 63.6% of the tests performed, somewhat lower than the percentage obtained for the

WCQ, whereas the product rule for external consistency was met for 79.2% of the test performed, slightly higher than that for the WCQ. Likewise, for the WCQ, modification indices were significant for 22.1% of the within-factor measurement error correlations and 12.3% of the between-factor measurement error correlations, while the corresponding figures for the CCS were 36.4% and 9.2%, respectively.

Given that the CCS was superior to the WCQ in terms of reliability, item loadings, and overall fit, it was surprising that the CCS did not yield fewer significant residuals and modification indices for measurement error correlations than the WCQ. One potential explanation for this anomaly is that the proportion of significant interitem correlations was substantially larger for the CCS than for the WCQ (60.6% vs. 38.9%). Because a residual is typically smaller in absolute magnitude than the corresponding interitem correlation, it follows that a residual is unlikely to be significant when the items themselves are not significantly correlated. Likewise, correlations between measurement errors are usually smaller than the correlation between the items involved, thereby implying that items with a nonsignificant correlation are unlikely to yield a significant modification index for the correlation between their measurement errors. Hence, the WCQ may have exhibited a modest proportion of significant residuals and modification indices for measurement errors correlations simply because the WCQ items themselves were not highly correlated.

Based on these results and those reported by Parker et al. (1993), it is difficult to recommend the continued use of the WCQ in its current form (Folkman & Lazarus, 1988). The limited support for the WCQ may be attributed largely to the empirical approach used for its development. As noted previously, accounts of the development of the WCQ (e.g., Folkman &

Lazarus, 1980, 1988) suggest that, although the selection of the WCQ items was guided by Lazarus' theory, multiple items were not generated to represent *a priori* dimensions specified by the theory. Moreover, the WCQ scales were constructed not by grouping items that shared similar content, but rather by performing exploratory factor analyses, thereby requiring the use of subjective criteria regarding the number of dimensions represented by the WCQ and the assignment of items to dimensions. As a result, the WCQ contains items that are conceptually heterogeneous, do not yield a stable factor structure, and provide an incomplete representation of the coping dimensions specified by Lazarus' theory (cf. Parker & Endler, 1992; Parker et al., 1993).

Unlike the WCQ, the CCS was developed by generating items intended to represent *a priori* coping dimensions specified by Edwards (1992) cybernetic theory and employing confirmatory factor analysis combined with evaluations of item content to determine the degree to which items corresponded to their assigned dimensions. As a consequence of this procedure, the CCS exhibited psychometric properties that, with few exceptions, were superior to those found for the WCQ. Furthermore, scales based on the CCS correspond directly and unambiguously to the coping dimensions associated with the cybernetic theory, thereby enhancing the utility of the measure for empirical investigations based on the theory.

Despite these strengths, the current version of the CCS has several drawbacks, such as highly specific content shared by some items assigned to the same scale and redundancy in certain items constituting the accommodation and devaluation scales. However, by dropping the flawed items from these two scales and retaining the four best items from each scale (see Table 3), a 20-item CCS may be formed. Confirmatory factor analysis of the associated measurement model indicated somewhat better fit than for the full 40-item CCS (TLI, IFI, and CFI values were .94, .95,

and .95, respectively), and reliabilities of all scales were .78 or higher. However, because the 20-item CCS was derived empirically, this evidence should be considered tentative, pending cross-validation. Furthermore, a third version of the CCS is currently under development. Until this version is available, the 20-item CCS may be used to provide a parsimonious representation of the coping dimensions outlined by the cybernetic theory with little loss of information over the full 40-item CCS.

Conclusion

This chapter has compared empirical and theoretical approaches to the measurement of coping, as represented by the WCQ and CCS, respectively. The findings reported here provide information regarding the validity of the WCQ and CCS that may be useful to researchers engaged in empirical coping research. At a more general level, the comparison of the WCQ and the CCS has demonstrated several important advantages of the theoretical approach to coping measurement, as evidenced by the superior psychometric properties of the CCS over the WCQ and the close correspondence between the CCS factors and ***a priori*** coping dimensions of theoretical interest. Although generalizations based on the measures and sample use here are necessarily limited, the results of this investigation clearly favor the theoretical approach to coping measurement over the empirical approach (cf. Carver et al., 1989). Consequently, future coping measures should be developed by generating multiple indicators of coping dimensions corresponding to relevant theory, and these measures should be empirically evaluated using confirmatory procedures such as those employed here. By following this approach, the psychometric properties of the resulting measures will be enhanced, information will be accumulated regarding the relative merits of the various coping frameworks proposed in the literature (Edwards, 1988; Latack & Havlovic, 1992; Lazarus &

Folkman, 1984; Silver & Wortman, 1980), and the linkages between coping theory and measurement will be strengthened.

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Footnotes

1. Coefficient alpha is often considered an index of internal consistency. This is partly a misnomer, because alpha depends solely on the number of items on a scale and the average interitem correlation (Nunnally, 1978), neither of which indicate internal consistency has been established. For this reason, alpha should not be considered an index of unidimensionality (Green, Lissitz, & Mulaik, 1977; Hattie, 1985).
2. The denominators for these ratios indicate the total number of residuals tested for a given scale. For internal consistency, this represents the total number of correlations among the items constituting a scale, whereas for external consistency, this represents the total number of correlations between the items constituting a scale and the remaining items in the measure.

Table 1

Descriptive Statistics, Correlations and Reliability Estimates for the CCS and WCCL

			CCS					WCCL							
	M	sd	1.	2.	3.	4.	5.	1.	2.	3.	4.	5.	6.	7.	8.
CCS															
1. Changing the situation	36.99	10.39	(.898)	.074	-.288**	-.314**	.215*	.726**	-.497**	-.169**	.243*	-.158**	-.178**	.827**	.403**
2. Accommodation	30.23	8.81	-.048	(.779)	.522**	.391**	.238**	.047	.541**	.370**	.234*	.490**	.424**	.025**	.258**
3. Devaluation	27.85	12.95	-.272**	.609**	(.945)	.548**	.083**	-.172**	.665**	.290**	-.001**	.443**	.370**	-.350**	.105**
4. Avoidance	22.77	10.59	-.291*	.407*	.527*	(.934)	.249*	-.199**	.851**	.514**	-.055**	.507**	.608**	-.385**	.113**
5. Symptom Reduction	31.05	9.97	.207	.176	.085	.218	(.863)	.699	.013-	.001	.653	.106	.336	.108	.324
WCQ															
1. Confrontive Coping	5.30	2.64	.399**	.051	-.025**	-.016**	.418**	(.397)	-.307**	.097**	.780**	-.024**	.034**	.831**	.670**
2. Distancing	7.16	3.49	-.391**	.510**	.562**	.617**	.006**	.002	(.669)	.786**	-.070**	.550**	.598**	-.362**	.155**
3. Self-Control	10.16	3.65	.051	.244**	.157**	.296**	.157**	.327**	.370**	(.582)	-.017**	.447**	.521**	.212**	.420**
4. Seeking Social Support	8.35	3.78	.315**	.157**	-.024**	-.055**	.413**	.396**	-.043**	.305**	(.648)	.111*	.306**	.384**	.377**
5. Accepting Responsibility	3.58	2.46	-.145*	.285**	.302**	.393**	.137**	.159**	.307**	.262**	.200**	(.539)	.742**	-.028**	.309**
6. Escape-Avoidance	6.59	4.20	-.096**	.229**	.301**	.446**	.315**	.294**	.291**	.309**	.254**	.519**	(.703)	-.153**	.174**
7. Planful Problem-Solving	9.91	3.37	.549**	-.045**	-.214**	-.241**	.077**	.405**	-.201*	.338**	.331**	-.020**	-.009**	(.595)	.634**
8. Positive Reappraisal	7.47	3.93	.307**	.250**	.156**	.152**	.331**	.503**	.220**	.398**	.336**	.196**	.247**	.407**	(.678)

Note: N=116. Reliabilities (Cronbach's alpha) are reported along the diagonal. Values below the diagonal are simple scale correlations; values above the diagonal are correlations from a 13-factor multi-item measurement model estimated using LISREL.

*p<.05 **p<.01

Table 2

Confirmatory Factor Analysis of the WCQ

	Item Loading
1. Confrontive coping	
46. Stood my ground and fought for what I wanted.[6,7]	.750**
7. Tried to get the person(s) responsible to change his or her mind.	.279**
17. I expressed anger to the person(s) who caused the problem.	.061
28. I let my feelings out somehow.[4,6,7]	.436**
34. Took a big chance or did something very risky.	.342**
6. I did something which I didn't think would work, but at least I was doing something.[2,3,5,6,8]	-.155
2. Distancing	
44. Made light of the situation; refused to get serious about it.[4,5,6]	.417**
45. Talked to someone about how I was feeling.[2,3,5,6]	.730**
18. Accepted sympathy and understanding from someone.[5]	.642**
22. I got professional help.[5,6]	.150
5. Accepting responsibility	
9. Criticized or lectured myself.[4,6]	.366**
29. Realized I brought the problem on myself.[6]	.499**
51. I made a promise to myself that things would be different next time.	.761**
25. I apologized or did something to make up.	.289**
6. Escape-Avoidance	
58. Wished that the situation would go away or somehow be over with.[1,4,7,8]	.667**
11. Hoped a miracle would happen.	.633**

13.	Went on as if nothing had happened.	.616**
41.	Didn't let it get to me; refused to think about it too much.[5,6]	.611**
21.	Tried to forget the whole thing.[5,6]	.569**
15.	Looked for the silver lining, so to speak; tried to look on the bright side of things.[1,3,4,7,8]	.431**
12.	Went along with fate; sometimes I just have bad luck.	.380**

3. Self-controlling

14.	I tried to keep my feelings to myself.[1,8]	.559**
43.	Kept others from knowing how bad things were.[1,4]	.610**
10.	Tried not to burn my bridges, but leave things open somewhat.[1,4,7,8]	.136
35.	I tried not to act too hastily or follow my first hunch.[1,4,7,8]	.350**
54.	I tried to keep my feelings from interfering with other things too much.[7]	.539**
62.	I went over in my mind what I would say or do.[1,2,4,7,8]	.235*
59.	Had fantasies about how things might turn out.	.567**
33.	Tried to make myself feel better by eating. drinking, smoking, using drugs or medication, and so forth.[5]	.370**
40.	Avoided being with people in general.[7]	.416**
50.	Refused to believe that it had happened.[2,3]	.377**
47.	Took it out on other people.[2,3]	.403**
16.	Slept more than usual.	.312**

7. Planful problem-solving

49.	I knew what had to be done, so I doubled my efforts to make things work.	.675**
26.	I made a plan of action and followed it.	.594**
1.	Just concentrated on what I had to do next--the next step.	.330**
39.	Changed something so things would turn out all right.	.451**
48.	Drew on my past experience I was in a similar position before.	.199
52.	Came up with a couple of different solutions to the problem.[5]	.485**

63.	I thought about how a person I admire would handle the situation and used that as a model.[1,2,4,7,8]	.180
4.	Seeking social support	
8.	Talked to someone to find out more about the situation.[1,3,7,8]	.408**
31.	Talked to someone who could do something concrete about the problem.[1,7,8]	.268**
42.	I asked a relative or friend I respected for advice.[1,2]	.635**
8.	Positive reappraisal	
23.	Changed or grew as a person in a good way.[3]	.701**
30.	I came out of the experience better than when I went in.	.760**
36.	Found new faith.[2,5,6]	.398**
38.	Rediscovered what is important in life.[6]	.299**
60.	I prayed.[2,3,6,7]	.207*
56.	I changed something about myself.[1,7]	.613**
20.	I was inspired to do something creative.[6,7]	.393**

χ^2 = 2091.12** df = 1147 GfI = .601 AGFI = .556 NFI2 = .469 PNFI2 = .439 TLI = .407

Note:Table entries are standardized factor loadings. For each item, numerical superscripts indicate the factor(s) for which that item yielded a significant modification index ($p<.05$).

*$p<.05$ **$p<.01$

Table 3

Confirmatory Factor Analysis of the CCS

	Item Loading
Changing the situation	
1. I tried to change something about the situation so things would turn out.	.675**
10. I tried to bring about what I thought should happen.[2,4]	.658**
14. I made a plan of action to change the situation and followed it.	.607**
18. I tried to change the situation to get what I wanted.	.760**
22. I tried to change the things about the situation that were bothering me.[2,4,5]	.688**
26. I focused my efforts on changing the situation.	.813**
35. I worked on changing the situation to get what I wanted.	.765**
20. I told myself the problem wasn't so serious after all.	.869**
24. I told myself the problem wasn't worth worrying about.[4]	.814**
28. I told myself the problem wasn't such a big deal after all.	.937**
32. I tried to convince myself that there were other things in life that were more important.[2,5]	.657**
36. I told myself the problem was not very important in the grand scheme of things.	.791**
Avoidance	
4. I tried to keep myself from thinking about the problem.	.738**
8. I tried to turn my attention away from the problem.	.798**

39.	I tried to fix what was wrong with the situation.	.856**
Accommodation		
6.	I told myself the situation was okay after all.[3,4]	.328**
15.	I tried to adapt to the situation.[3,5]	.375**
17.	I tried to accept the situation as it was.[3]	.300**
19.	I tried to just accept things as they were.[1,3]	.261**
23.	I made an effort to change my expectations.	.754**
27.	I tried to convince myself that the way things were was, in fact, acceptable.[3]	.447**
31.	I tried to adjust my expectations to meet the situation.[1]	.852**
40.	I tried to adjust my own standards.	.816**
Devaluation		
3.	I tried to convince myself that the problem was not very important after all.	.871**
7.	I told myself the problem was unimportant.	.838**
11.	I tried to convince myself that the problem was, in fact, pretty insignificant.	.838**
12.	I tried to just forget the whole thing.[1,5]	.835**
16.	I tried to think about other things.	.789**
25.	I refused to think about the problem.	.770**
29.	I tried to keep my mind off the problem.[5]	.827**
33.	I tried to simply ignore the problem.[2,3,5]	.790**
37.	I tried to avoid thinking about the problem.[2]	.874**
Symptom Reduction		
2.	I tried to just let off steam.	.688**
5.	I tried to let my feelings out somehow.	.624**
9.	I did something that I thought would soothe my nerves.	.652**
13.	I tried to relieve my tension somehow.	.735**
21.	I did something I enjoyed, just to make myself feel better.	.584**
30.	I tried to just get it off my chest.	.734**
34.	I tried to just calm down.[4]	.646**
38.	I just tried to relax.	.662**

χ^2 = 1303.85**	df = 730	GfI = .652	AGFI = .609	NFI = .815	PNFI = .762	TLI = .799

Note: Table entries are standardized factor loadings. For each item, numerical superscripts indicate the factor(s) for which that item yielded a significant modification index ($p<.05$). Underlined item numbers indicate items forming the 20-item CCS (See Discussion).

*$p<.05$ **$p<.01$