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EMPIRICAL CONTRIBUTIONS

Adaptation in Patients With Chronic Rheumatoid Arthritis: Application of a General Model

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We derived a model of appraisal, coping, and adaptation in patients with rheumatoid arthritis (RA) from the more general theory of Lazarus and Folkman (1984) and examined this model using a longitudinal data set spanning 4 years and involving 239 RA patients (of whom 157 contributed to the primary analyses, with the remainder contributing to various follow-up analyses). This model attempted to identify the short- and long-term adaptational consequences of coping as well as the antecedents (appraisals, beliefs, social support, disease activity, etc.) that promote particular coping styles. Interrelations among the variables were examined using path-analytic techniques. Many observed relations were consistent with the model. Significant relations were subjected to more stringent analyses examining the ability of hypothesized causal variables to predict changes in outcome variables 1 year later. These analyses provided additional support for many observed relations and suggested the existence of a vicious cycle involving helplessness appraisals, passive coping with pain, and psychosocial impairment that promotes maladaptation in the face of RA. Theoretical implications, strengths, and limitations of the study are discussed.

Key words: rheumatoid arthritis (RA), pain coping, chronic illness, psychological adaptation, helplessness

Rheumatoid arthritis (RA) is a significant source of stress for many individuals. It is a chronic systemic autoimmune disease that involves inflammation of the joints and produces pain of variable intensity and duration. For many, the disease is characterized by unpredictable periods of remission and exacerbation; after periods of quiescence, the disease can "flare" without warning into a bout of intense pain. When flares are frequent or of long duration, there is often disfigurement, loss of functional ability, and significant work disability (Yelin, Meenan, Nevitt, & Epstein, 1980).

Not surprisingly, RA and its associated pain have been linked to poor adjustment, including depressive symptoms and impaired quality of life (e.g., Brown, 1990; Mindham, Bagshaw, James, & Swannell, 1981; Moldofsky & Chester, 1970). However, there is considerable variability in the relation between RA and adjustment: Given the same degree of pain, some individuals appear to cope well and adjust to their condition, whereas others fare poorly (e.g., Brown, Nicassio, & Wallston, 1989; Brown, Wallston, & Nicassio, 1989; Keefe, Brown, Wallston, & Caldwell, 1989). Because there is no cure for RA, and medical treatments for the pain are often only marginally effective (e.g., Decker et al., 1984), it is important to identify the psychosocial factors influencing the relations among the disease, its attendant pain, and adjustment. By understanding the factors leading to relatively good adjustment in the face of potentially debilitating pain, it becomes possible to develop and test interventions to assist those who are managing relatively poorly.

Something as variable as long-term adaptation to a chronic illness is likely to involve numerous interacting factors. Therefore, it is important to have available a well-developed theory to guide the selection and interpretation of the observations to be made. One promising avenue—the one we have been taking—is to adopt a general theoretical framework demonstrated to be applicable to related domains and to apply this framework to a new domain. The framework we have adopted is the stress-and-coping theory of Lazarus and Folkman (1984). This theory has proved to be of heuristic value in a variety of domains, and considerable work on it has involved the study of stress and adaptation in an aging community sample for whom declining health and associated functional limitations are significant issues (e.g., Folkman & Lazarus, 1980). Thus, the theory is likely to be applicable to chronic-pain patients, such as those with RA.

EXPLICATION OF THE MODEL

The model we derived from the theory is presented in Figure 1. Its fundamental premise is that, beyond the direct effects of disease activity, how one copes with a disease is an important determinant of adjustment. Although the adaptive utility of any specific form of coping is context specific (cf. Lazarus, 1983), we propose that, if habitually employed, some styles of coping are adaptive whereas others are maladaptive. In particular, habitually responding to one's illness and associated limitations with passive behaviors, such as taking to bed or restricting one's social activities, is proposed to result in relatively poor long-term adaptation (Brown, Nicassio, & Wallston, 1989). Conversely, remaining active despite pain may be more beneficial, although there are likely to be limits to these benefits because the disease presents real physical limitations, the denial of which could prove injurious.

Given this premise, the model attempts to identify both the consequences of coping and the antecedents that promote particular coping styles. Functional status is represented at two levels, both of which serve as outcomes of the coping process and as antecedents

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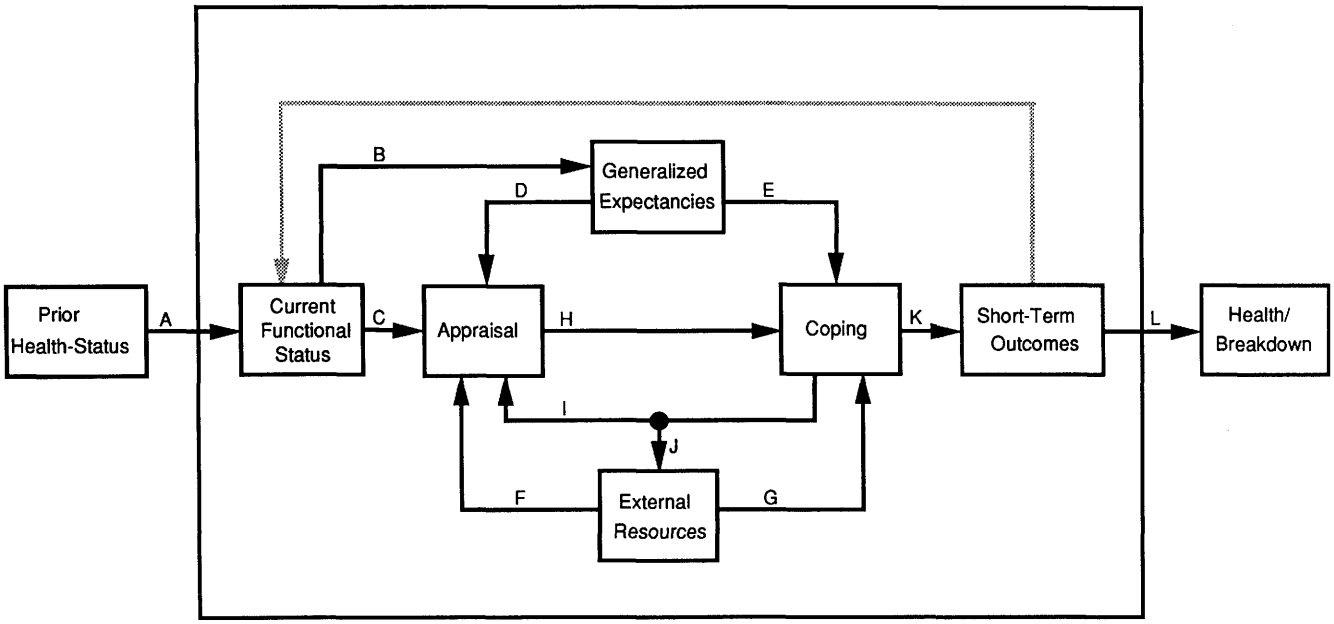

FIGURE 1 Depiction of the theoretical model representing the general variables involved in adjustment to RA, derived from the stress-and-coping model developed by Lazarus and Folkman (1984). The letters used to label the hypothesized causal paths correspond to the letters used to label the paths involving specific variables in Figure 2.

to this process. At the more general level, we conceptualize health as a broad, relatively stable variable that summarizes one's overall functional abilities. At a more specific level, health is expressed through several less stable indicators that summarize one's abilities and limitations at particular times and within particular domains. These specific variables include life satisfaction, depressive symptoms, disease-related pain, and psychosocial impairment. According to the model, one's coping efforts primarily influence the specific indicators in the short term, but the effects on the specific indicators summate over the long term to influence overall health.

Coping attempts are primarily determined by appraisals of the disease and its associated limitations. For instance, interpreting disease as a permanent harm that one is helpless to influence promotes passive coping and is likely to result in depressive symptoms (e.g., Abramson, Seligman, & Teasdale, 1978), whereas interpreting disease as a challenge to be overcome promotes more active coping. The appraisals are determined by three general factors. One's current status with respect to the disease (e.g., the extent of pain and/or functional impairment) is the central aspect of the situation to be appraised. The two additional factors influencing appraisals are (a) generalized beliefs and expectations regarding one's abilities and other internal resources and (b) perceived availability of external resources, including social support (cf. C. A. Smith & Lazarus, 1990). Beliefs that few internal or external resources are available promote appraisals of helplessness.

Although appraisal is posited to be the primary influence on coping, both beliefs and external resources can influence coping directly. For instance, when faced with an acute flare, an individual might engage in active coping, despite appraisals of helplessness, if that person is invested in a strong sense of general competence and/or has received encouragement from his or her support network. Finally, coping can directly influence appraisals (e.g., by refusing to accept one's limitations) and external resources (e.g., by recruiting social support).

It should be noted that the model is dynamic and expresses itself over time. Although several variables are depicted as having reciprocal influences, these influences are separated by time. Thus the model is not "circular" in a nonexplanatory sense (cf. Bandura, 1978). For instance, the shaded arrow linking short-term outcomes to current functional status indicates that the short-term outcomes of previous coping activities are also indicators of current functional status that contribute to future appraisals. The indicators of current functional status, however, did not contribute to the prior appraisals and coping activities that determined the current status. Instead, functional-status variables from a previous point in time contributed to those prior appraisals and coping activities.

SUPPORT FOR THE MODEL

Several studies have provided support for individual components of this model. First, coping style has been implicated as an important factor in adjustment to RA. The tendency to respond to flares by engaging in passive pain-management strategies (e.g., focusing on the pain, restricting social activities, etc.) or with cognitive distortions such as catastrophizing (i.e., assuming the worst) has been associated with high levels of depressive symptoms and functional impairment (e.g., Brown, Nicassio, & Wallston, 1989; Keefe et al., 1989; T. W. Smith, Peck, Milano, & Ward, 1988). Use of more active pain-management strategies, however, has not been consistently linked to particular adaptational outcomes, perhaps reflecting the more context-sensitive effects of using these strategies (Brown, Nicassio, & Wallston, 1989).

In addition, the dispositional tendency to appraise oneself as helpless and unable to influence the course of one's RA has been found to be correlated not only with a passive pain-management coping style but also with depressive symptoms and psychosocial impairment (T. W. Smith, Peck, & Ward, 1990; Stein, Wallston, Nicassio, & Castner, 1988). Conversely, with statistical controls for

self-reported pain, a generalized sense of competence has been found to contribute to increased life satisfaction and to buffer against depressive symptoms (C. A. Smith, Dobbins, & Wallston, 1991).

Finally, the perceived availability of social support has been associated with psychological well-being and relatively low depressive symptomatology in RA patients (e.g., Affleck, Pfeiffer, Tennen, & Fifield, 1988; Brown, Wallston, & Nicassio, 1989; Fitzpatrick, Newman, Lamb, & Shipley, 1988).

OVERVIEW OF THE PRESENT RESEARCH

Although the preceding findings are consistent with the model we have outlined, they fail to adequately evaluate this model in several respects. First, with few exceptions (e.g., Brown, Nicassio, & Wallston, 1989; Brown, Wallston, & Nicassio, 1989; C. A. Smith et al., 1991), much of the evidence is based on studies employing purely cross-sectional designs, thereby allowing only the weakest of causal inferences. Moreover, virtually all the studies have examined particular components of the model in isolation, and none has attempted to examine the entire model in a single analysis. Although helplessness appraisals, passive coping with pain, and perceived adequacy of social support have all been linked to short-term outcomes in ways consistent with the model, it is difficult, until these influences have been examined simultaneously, to determine whether they each represent independent influences on the outcomes or whether, as the model predicts, the influences of both social support and appraisal are primarily mediated through coping.

Therefore, this article explores the utility of the proposed model for understanding individual variation in adaptation to RA using a 4-year longitudinal data set in which indicators for each of the major variables in the model were assessed annually. Although portions of this data set have been used previously to document several individual relations, already described here (i.e., Brown, 1990; Brown, Nicassio, & Wallston, 1989; Brown, Wallston, & Nicassio, 1989; Keefe et al., 1989; C. A. Smith et al., 1991; Stein, Wallston, Nicassio, & Castner, 1988), the present analyses represent the first attempt to examine comprehensively the full model. In addition, these analyses represent the first examination of these relations over the entire 4-year period. The longitudinal design allows us to assess the direction of causal influence by prospectively examining the ability of various factors to predict subsequent changes in other factors. It also allows such analyses to be replicated over multiple 1-year intervals.

Our analytic approach is quasi-exploratory. It is not our intent to "test" (and either accept or reject) a fully prespecified model, because we believe such testing to be premature. Instead, we have used the model to identify the particular variables to be examined and to guide the design of our analyses with a view toward identifying promising relations within the context of the full model that merit further investigation. Nonetheless, it should be noted that, although particular relations between individual variables are not specified, the model does specify the more general types of relations that should and should not be observed among various classes of variables (see Figure 1). For instance, any effects of generalized expectancies or of external resources on either short-term outcomes or health should be mediated through coping, and generalized expectancies and external resources should not influence short-term outcomes or health directly. Thus, it is possible to observe relations (or the absence of relations) that violate the model's predictions and, thus, that indicate weaknesses in the model and/or our instantiation of it.

METHOD

Subjects and Design

Subjects for the present investigation were 239 individuals (58 men, 181 women) diagnosed with definite or classic RA by practicing rheumatologists. Most subjects were recruited from four rheumatology practices in the middle Tennessee area, with a smaller number coming from practices in Connecticut, South Carolina, and Virginia.

At the time of selection, all participants were at least 18 years old and had been diagnosed with RA for 7 years or less. Mean age was 50.5 years (*SD* = 13.6 years), and mean time since diagnosis was 3.22 years (*SD* = 2.16 years). Ninety-six percent of the participants were White, 1% were Black, and 2% were Hispanic. Seventy-seven percent were married, 10% were divorced or separated, 8% were widowed, and 5% were single. Forty-one percent were employed full time, 14% were retired, and 13% were unemployed. Nineteen percent had less than a high school education, 34% had completed high school, and 46% had some education beyond high school.

Over 4 years, subjects completed questionnaires that were mailed to their homes approximately every 6 months for the first 3 years—with a final questionnaire being sent at the end of the fourth year—for a total of eight waves of data collection. The study was designed to include the variables of primary interest in the annual surveys (Waves 1, 3, 5, 7, and 8), with the semi-annual surveys (Waves 2, 4, and 6) being used to gather more exploratory information. Therefore, the present investigation focuses exclusively on the five annual surveys.

Measures

Global health status. Global health status was assessed with a one-item visual analog scale measuring the subject's global assessment of his or her functioning in the face of arthritis. This measure has been shown to correlate highly with other self-assessments of health status, including the physical functioning scales of the Arthritis Impact Measurement Scales (AIMS; Meenan, Gertman, & Mason, 1980). This measure was collected in all five data-collection waves and demonstrated an average 1-year stability of .67.

Current functional status/short-term outcomes. Four measures assessing life satisfaction, depressive symptomatology, pain, and psychosocial impairment were included to measure various aspects of the subject's current adaptation to his or her RA. As indicated in the theoretical model (see Figure 1), depending on the point at which one enters the causal sequence, these measures can serve either as antecedent measures of current functioning, hypothesized to influence subsequent appraisal and coping, or as short-term outcomes of one's previous coping attempts.

Life satisfaction. Life satisfaction was assessed with the Satisfaction With Life Scale (Diener, Emmons, Larsen, & Griffin, 1985). As Diener et al. reported, this five-item scale has good internal consistency and temporal stability and correlates highly with alternative measures of life satisfaction. In the present sample, it was included in all but the first survey, and it demonstrated an average internal consistency (alpha) of .87 and an average 1-year stability of .69.

Depressive symptomatology. Depressive symptomatology was measured with the Center for Epidemiological Studies–Depression Scale (Radloff, 1977). This extensively validated 20-item scale

assesses how often depressive symptoms, including dysphoric mood, lack of positive mood, and vegative symptoms, occurred during the past week. In the present sample, it was included in all time periods. Its average internal consistency and 1-year stability coefficients were .92 and .62, respectively.

Pain. Pain was measured by a single index, combining three distinct self-report measures, that has been used successfully in previous research (e.g., Brown & Nicassio, 1987). The first was the AIMS Pain subscale (Meenan et al., 1980). The second was a visual analog rating of the intensity of pain experienced during the past month—which has been used frequently with chronic-pain populations (e.g., Turk, Meichenbaum, & Genest, 1983). The third was a flare index that combined ratings of the number and severity of RA flares during the past 6 months by multiplying the number of flares by the square of their severity (cf. Brown & Nicassio, 1987). Each of the three measures was standardized across subjects, and then they were summed within subjects to obtain the final index. This index was included in all time periods, and its average internal consistency and 1-year stability were .90 and .66, respectively.

Psychosocial impairment. In all but the first survey, psychosocial impairment was assessed by seven items that determined the degree to which RA had caused the subject interference in each of seven areas during the past 6 months: family relationships, hobbies and sports, sexual activities, sleeping, social activities, working, and comforting and helping others. The first survey included only the first six items. The scale's average internal consistency and 1-year stability were .85 and .69, respectively.

Generalized expectancies. Three measures were included to assess the subjects' general expectations and beliefs. The first was a four-item measure of perceived competence, designed to measure one's self-perceived ability to accomplish important tasks. C. A. Smith et al. (1991) provided evidence for the reliability and validity of the scale. It was included in all but the last survey. Its average internal consistency was .72, and its average 1-year stability was .70.

The second two generalized-belief measures consisted of the Internal Locus of Control (Internal LOC) and Chance Locus of Control (Chance LOC) subscales of Levenson's (1973) Locus of Control Scale. These commonly used and extensively validated scales assess the degree to which an individual believes that he or she has control over significant events in his or her life versus the extent to which these events are seen as controlled by chance events. These measures were included in Waves 3 and 7 of data collection. The average alpha reliabilities in these waves were .73 and .67, and the 2-year stabilities were .69 and .61 for the Internal LOC and Chance LOC subscales, respectively.

External resources. The availability of external resources was assessed with three scales measuring distinct facets of social support that have been found to predict pain and functioning in arthritis patients (DeVellis, DeVellis, Sauter, Harring, & J. L. Cohen, 1986). The first was a four-item scale, based on the "strong ties" measure of social support (Dean & Lin, 1977), that assesses the respondent's perceived quality of emotional support. This scale was included in all time periods. It displayed an average internal consistency of .85 and an average 1-year stability of .63. The second scale consisted of three items assessing the availability of instrumental support (Strogatz, 1983). It, too, was included in all time periods, and its average internal consistency and 1-year stability were .73 and .56, respectively. The third scale was a three-item scale taken from Donald, Ware, Brook, and Davies-Avery's (1978) Social Health Scale. Designed to measure the extensivity of one's social network, this scale was included in all but the last time period. Its average internal consistency was .69, and its average 1-year stability was .76.

Dispositional appraisal. The subjects' dispositional appraisals of their arthritis were assessed with the five-item Helplessness subscale from the Arthritis Helplessness Index (Stein, Wallston, & Nicassio, 1988). This measure has been shown to be a valid indicator of the degree to which patients with arthritis characteristically appraise themselves as incapable of dealing with arthritis-related events (Stein, Wallston, & Nicassio, 1988; Stein, Wallston, Nicassio, & Castner, 1988). This measure was assessed at all time periods and demonstrated an average alpha reliability of .69 and an average 1-year stability of .71.

Coping style. The Active Coping and Passive Coping subscales of the Vanderbilt Pain Management Inventory (Brown & Nicassio, 1987) were used to assess the extent to which subjects typically responded to bouts of moderate to intense arthritis-related pain with active or passive coping strategies. *Active coping* refers to attempts to continue to function despite one's pain, such as staying busy and attempting to ignore the pain. In contrast, *passive coping* refers to more passive strategies, such as taking to bed, restricting social activities, and so on. Both subscales were assessed in all but the last time period. The Active Coping subscale demonstrated an average alpha reliability of .73 and an average 1-year stability of .67. The Passive Coping subscale demonstrated an average alpha reliability of .82 and an average 1-year stability of .72.

Procedure

Three distinct analyses are reported. First, we examined the zero-order correlations among the variables selected for their relevance to the theoretical model (see the following overview of the results for the selection criteria). Next, we further examined the patterns of covariation among the selected variables using path-analytic techniques (least-squares regression). Finally, for those relations supported by the path analysis, we examined the ability of the purported causal factors to predict changes in the purported effects over 1 year. These latter analyses were replicated in all pairs of contiguous annual waves containing the necessary data.

Each analysis included all subjects with complete data for the variables included in that analysis. The present investigation is part of an ongoing study that initially involved 368 participants. Of the original participants, 239 supplied sufficient data to be included in at least one of the reported analyses, and these 239 individuals comprise the sample already described. Across waves, the sample size decreased somewhat due to missing data and subject attrition, with 157 subjects supplying complete data for all the variables entering into the large path analysis (the second main analysis). Therefore, to maintain comparability between the correlational analysis and the path analysis, only those 157 subjects participated in these two analyses. The third set of analyses involved comparisons across the four possible pairs of contiguous waves (i.e., Waves 1 and 3, 3 and 5, 5 and 7, and 7 and 8). These analyses included all subjects with complete data for the two relevant waves. The net result was sample sizes of 206, 160, 153, and 147 for the analyses involving Waves 1 and 3, 3 and 5, 5 and 7, and 7 and 8, respectively.

Although subject attrition affected the mean levels of several variables, it does not appear to have substantially influenced the interrelations among the variables. Not surprisingly, of the 368 original participants, the 239 supplying sufficient data to be included in at least one analysis showed evidence of being somewhat healthier and better adjusted than the 129 individuals who were not included. At Wave 1, relative to the 129 individuals who were dropped from all analyses, the 239 participants reported better global health (Ms = 4.57 and 4.15), $t(366) = 2.81$, $p < .01$, higher self-perceived competence (Ms = 3.67 and 3.11), $t(366) = 3.75$, $p < .001$, more available instrumental support (Ms = 5.44 and 4.83), $t(337) = 3.15$, $p < .01$, marginally less depression (Ms = 1.61 and 1.86), $t(348) = -1.83$, $p = .07$, engaging in more active coping (Ms = 3.57 and 3.19), $t(353) = 2.89$, $p < .01$, and engaging in marginally less passive coping (Ms = 3.31 and 3.56), $t(350) = -1.91$, $p = .06$.[1] Nonetheless, the patterns of intercorrelation among the variables were highly similar within both groups and correlated .92 with each other.

At Wave 3, the 157 subjects who were included in the main correlational and path analyses showed similar evidence of slightly better adjustment than the 82 participants who did not contribute to these analyses but did participate in at least one analysis. Relative to the others, the 157 participants in the main analyses reported marginally better global health (Ms = 4.75 and 4.36), $t(237) = 1.86$, $p = .06$, less depression (Ms = 1.39 and 1.82), $t(237) = -2.72$, $p < .01$, less psychosocial impairment (Ms = 2.28 and 2.72), $t(227) = -1.99$, $p < .05$, less pain (Ms = –.26 and .56), $t(232) = -2.27$, $p < .05$, higher self-perceived competence (Ms = 3.79 and 3.43), $t(237) = 1.99$, $p < .05$, lower appraised helplessness (Ms = 2.64 and 3.08), $t(231) = -2.24$, $p < .05$, engaging in more active coping (Ms = 3.86 and 3.48), $t(226) = 2.36$, $p < .05$, and engaging in less passive coping (M = 2.91 and 3.39), $t(234) = -3.10$, $p < .01$. Once again, however, the patterns of intercorrelation among the variables were highly similar within both groups ($r = .91$).

RESULTS AND DISCUSSION

Overview of Analytic Strategy

The validity of the theoretical model was examined using a series of three increasingly rigorous and causality-oriented analyses. In the first two analyses, the variables were organized across the first 3 years of data collection in a manner consistent with the causal ordering hypothesized for the model (cf. Figure 1; the data from Wave 8 were not included to minimize subject attrition). Initial health status was assumed to be first in the causal chain, followed, in order, by current functional status, generalized expectancies and external resources (which were not ordered among themselves), appraisal, coping, short-term outcomes, and final health status. The analyses were centered on Wave 5, with the appraisal and coping variables coming from this wave. This allowed us to place the antecedents of appraisal temporally before the appraisal measures (i.e., so that they would come from Wave 1, 3, or 5, depending on how they were assessed, as discussed later) and the consequences of coping temporally after coping (i.e., so that they would come from Wave 5 or Wave 7).

The wave from which a given variable was selected was determined by considering both the variable's place in the hypothesized causal sequence and the measurement of the variable. Variables were selected to ensure that they were assessed temporally before, or contiguous with, their purported effects. Initial health status, first in the causal sequence, was selected from Wave 1. The variables measuring current functional status came from Wave 3 or Wave 5. Both the life satisfaction and depression measures were designed to assess the subjects' current psychological state and, thus, were drawn from Wave 3 to keep them temporally before the appraisal and coping variables. Conversely, the pain and psychosocial impairment measures were designed to assess the levels of these variables during the previous 6 months, and they were drawn from Wave 5. The effects of generalized expectancies and social support on appraisal were hypothesized to be relatively instantaneous because these variables reflect sources of information the person actively draws upon during appraisal (cf. C. A. Smith & Lazarus, 1990). Therefore, when possible, these variables were selected from Wave 5. However, the two LOC subscales were not available for this wave, so they were drawn from Wave 3. The short-term outcome measures came from either Wave 5 or Wave 7 in a manner that paralleled the selection of these variables as measures of current functional status: The measures of life satisfaction and depression (assessing current levels) came from Wave 5, and the pain and psychosocial impairment measures (assessing levels over the past 6 months) came from Wave 7. Finally, the global health outcome measure, last in the causal sequence, was selected from Wave 7. The resulting variables are summarized in Table 1.

In the first analysis, we simply examined the zero-order correlations among these variables. Because we were examining a large number of correlations in a simple manner, we considered only those correlations significantly different from zero at $p < .001$.

Next we performed a least-squares regression path analysis on these same variables. Because this analysis was theoretically guided and more restrictive than the first analysis, the less stringent .01 level of significance was used to identify nonzero paths. Our goal in this analysis was to examine the model as comprehensively as we could within the context of a single analysis. Each variable was regressed simultaneously on all variables hypothesized to be causally preceding that variable. Thus, each indicator of current functional status was regressed on initial health status; each of the variables measuring generalized expectancies and external resources was regressed on the measures of current functional status and prior health status (but the equations for the Wave 3 LOC variables did not include pain and psychosocial impairment from Wave 5); arthritis helplessness was regressed on all the variables measuring external resources, generalized expectancies, current functional status, and initial health status; these same variables plus arthritis helplessness were used for both coping variables; and so on.

There were three exceptions to this strategy. First, in estimating the effects of causally prior variables on the short-term outcomes, the instantiation of the variable of interest as a measure of functional status was not included to keep these analyses distinct from the analyses of change that follow. For example, the equation testing for influences on depressive symptomatology regressed depression from Wave 5 on initial health status, all the current functional status variables except Wave 3 depression, the three measures of generalized expectancies, the three social support variables, arthritis help-

[1] All significance tests reported in this article are two tailed. In addition, to facilitate comparisons across measures, we mathematically transformed all scales (except Pain, which is on a standard scale) to 7-point (1 to 7) scales. The degrees of freedom vary slightly across measures due to missing data.

TABLE 1
Intercorrelations Among Variables Entering Into the Comprehensive Path Analysis

Variable	Variable						
	Initial Health Status (1)	*Life Satisfaction (3)*	*Depression (3)*	*Psychosocial Impairment (5)*	*Pain (5)*	*Internal LOC (3)*	*Chance LOC (3)*
Life satisfaction (3)	.34						
Depression (3)	–.40	–.56					
Psychosocial impairment (5)	–.55	–.36	.44				
Pain (5)	–.57	–.32	.36	.76			
Internal LOC (3)	.29	.60	–.41	–.36	–.28		
Chance LOC (3)	—	—	—	—	—	—	
Perceived competence (5)	.30	.59	–.56	–.49	–.44	.58	—
Quality of emotional support (5)	—	—	–.37	–.35	–.27	—	—
Availability of instrumental support (5)	—	—	—	—	—	—	—
Extent of social network (5)	—	—	—	—	—	—	—
Arthritis helplessness (5)	–.50	–.39	.46	.69	.67	–.40	.32
Active coping with pain (5)	—	—	—	—	—	—	—
Passive coping with pain (5)	–.37	–.31	.33	.58	.51	–.34	—
Life satisfaction (5)	.36	.69	–.49	–.42	–.39	.42	—
Depression (5)	–.45	–.34	.60	.71	.66	–.34	—
Psychosocial impairment (7)	–.46	–.43	.38	.74	.57	–.42	—
Pain (7)	–.49	–.30	—	.54	.65	—	—
Final health status (7)	.59	.44	–.40	–.57	–.57	.38	—

lessness, and the two coping measures. Similarly, neither initial health status nor the variables representing current functional status were included in the regression examining the influences on final health status. Thus, health status at Wave 7 was regressed on the measures of generalized expectancies, the social support variables, arthritis helplessness, the coping measures, and the four measures of short-term outcomes. Finally, ordering the variables in this manner did not permit an explicit examination of the hypothesized causal linkages from coping to subsequent appraisal and social support (see Figure 1). Therefore, these paths were not assessed in the path analysis, but they were examined in the final set of analyses.

The last set of analyses dynamically examined each of the paths supported by the path analysis, as well as the hypothesized paths from coping back to both appraisal and social support. These analyses examined the extent to which the hypothesized causal variable (the independent variable) predicted changes in the hypothesized effect (the dependent variable) 1 year later. This was accomplished by regressing the dependent variable from a particular wave on the independent variable from the wave 1 year earlier, after first controlling for the level of the dependent variable in that prior wave. Each of these analyses was replicated in all pairs of contiguous waves that contained the necessary measures. Because these analyses are rather stringent tests for detecting relations and because they replicate relations already observed in the main path analysis, the .05 level of significance was used.

Correlational Analysis

The significant (at $p < .001$) zero-order intercorrelations among the variables entering into the comprehensive path analysis are depicted in Table 1.

Examination of this table indicates that the majority of the variables are moderately interrelated and that, in every case, the direction of the relation is consistent with the predictions of the general model. For instance, appraisals of arthritis helplessness are significantly associated with relatively poor health and functioning (i.e., low life satisfaction; elevated pain, psychosocial impairment, and depression), reduced internal and external resources (e.g., low perceived competence and inadequate perceived availability of emotional support), and passive coping with pain. In a similar manner, the measures of health and functioning are all moderately intercorrelated, with health and life satisfaction indicating positive functioning and with pain, impairment, and depressive symptoms indicating relatively poor functioning.

Given the large number of moderate-to-high correlations, variables less strongly related to the others in the system are perhaps more notable than ones demonstrating predicted relations. Chance LOC, active pain coping, and two of the three social support measures are relatively unrelated to the other variables in the system. Of the social support variables, only the perceived quality of emotional support is consistently related to health, functioning, appraisal, or coping. Active pain coping is unrelated to virtually all the other variables, and Chance LOC is significantly correlated only with appraisals of arthritis helplessness.

Comprehensive Path Analysis

The results of the correlational analysis indicate the existence of numerous moderate-to-strong relations—each of which is consistent with the general model—and further identify several variables, including active pain coping and certain forms of social support, that do not appear to contribute reliably to adaptation to RA. However, these simple correlations do not indicate whether the patterns of observed covariation are consistent with the model's hypothesized causal structure. For instance, the measures of current functional status, arthritis helplessness, perceived competence, and passive

TABLE 1 *(Continued)*

Variable										
Perceived Competence (5)	*Quality of Emotional Support (5)*	*Availability of Instrumental Support (5)*	*Extent of Social Network (5)*	*Arthritis Helplessness (5)*	*Active Coping With Pain (5)*	*Passive Coping With Pain (5)*	*Life Satisfaction (5)*	*Depression (5)*	*Psychosocial Impairment (7)*	*Pain (7)*
.36										
.31	—									
—	.29	—								
−.56	−.30	—	—							
—	—	—	—	—						
−.49	−.30	—	—	.60	−.31					
.65	.38	—	—	−.49	—	−.34				
−.58	−.44	—	—	.71	—	.55	−.47			
−.47	−.40	−.28	—	.48	—	.52	−.40	.50		
−.35	—	—	—	.32	—	.40	−.32	.41	.69	
.53	—	—	—	−.45	—	−.39	.47	−.50	−.65	−.73

Notes. For clarity of presentation, only correlations significantly different from zero at $p < .001$ are depicted. The number in parentheses following each variable name indicates the wave of data collection (1, 3, 5, or 7) from which that variable came.

coping with pain are all moderately to strongly correlated. However, it is unclear whether the relations between functional status and passive coping with pain are largely mediated through generalized expectancies (e.g., perceived competence) and appraisal (arthritis helplessness), as the model would predict. The comprehensive path analysis was conducted to address issues of this sort. The results of this analysis are presented in Figure 2.

Only the paths that emerged as significant at $p < .01$ are depicted. The letters used to label the specific paths in this analysis correspond to the letters used to label the analogous general paths in Figure 1. Unlabeled paths were not predicted by the theoretical model. The coefficients depicted along these paths are the beta weights (standardized regression coefficients) produced by the path analysis. The asterisks following the regression coefficients represent the number of dynamic analyses (described later and in Table 2) in which the causal nature of the particular relation received further support. It should be noted that, as indicated by the absence of regression coefficients, two of the relations depicted in this figure—from passive coping with pain to both arthritis helplessness and quality of emotional support—were not examined in the path analysis but were examined in the dynamic analysis.

Examination of Figure 2 reveals several statistically significant relations, most of which are consistent with the model. The only general paths predicted by the model that were not supported involved either generalized expectancies or external resources predicting appraisal and coping (paths D through G in Figure 1). Generalized expectancies were not related to appraisal as strongly as anticipated—of the three, only Chance LOC made a unique contribution to the prediction of arthritis helplessness—and were not at all directly related to passive coping with pain. Similarly, the social support variables did not contribute directly to the prediction of either appraisal or coping.

Conversely, by contributing directly to the prediction of short-term outcomes, these same expectancies and external resources were responsible for several unpredicted relations. For instance, perceived competence contributed directly to the predictions of life satisfaction and depressive symptoms, and quality of emotional support contributed to the prediction of psychosocial impairment. These direct effects appear to be in lieu of predicted indirect effects in which appraisal and coping mediate the relation between these variables and the outcomes. Absence of the predicted mediation suggests a need to expand and improve the measures of appraisal and coping or, perhaps, to revise the model. Similarly, appraisals of arthritis helplessness contributed directly to the prediction of depressive symptoms—instead of this relation being mediated through coping. In the remaining unpredicted relations, either initial health status or psychosocial impairment contribute to prediction of short-term outcomes: Both initial health status and psychosocial impairment contributed significantly to prediction of pain, and psychosocial impairment also contributed to prediction of depressive symptoms.

Dynamic Analyses

All the statistically significant paths observed in the path analysis received further scrutiny in a final set of dynamic analyses that examined the extent to which the purported cause was able to predict change in the purported effect 1 year later. The results of these analyses are listed in Table 2.

These analyses, by focusing on the prediction of change, are a conservative method for testing relations because, as indicated by the large stability coefficients for most variables, there was relatively little systematic change to be captured in these data. Across all measures for which both stability and reliability estimates were available, the average 1-year stability was .67, which approached the

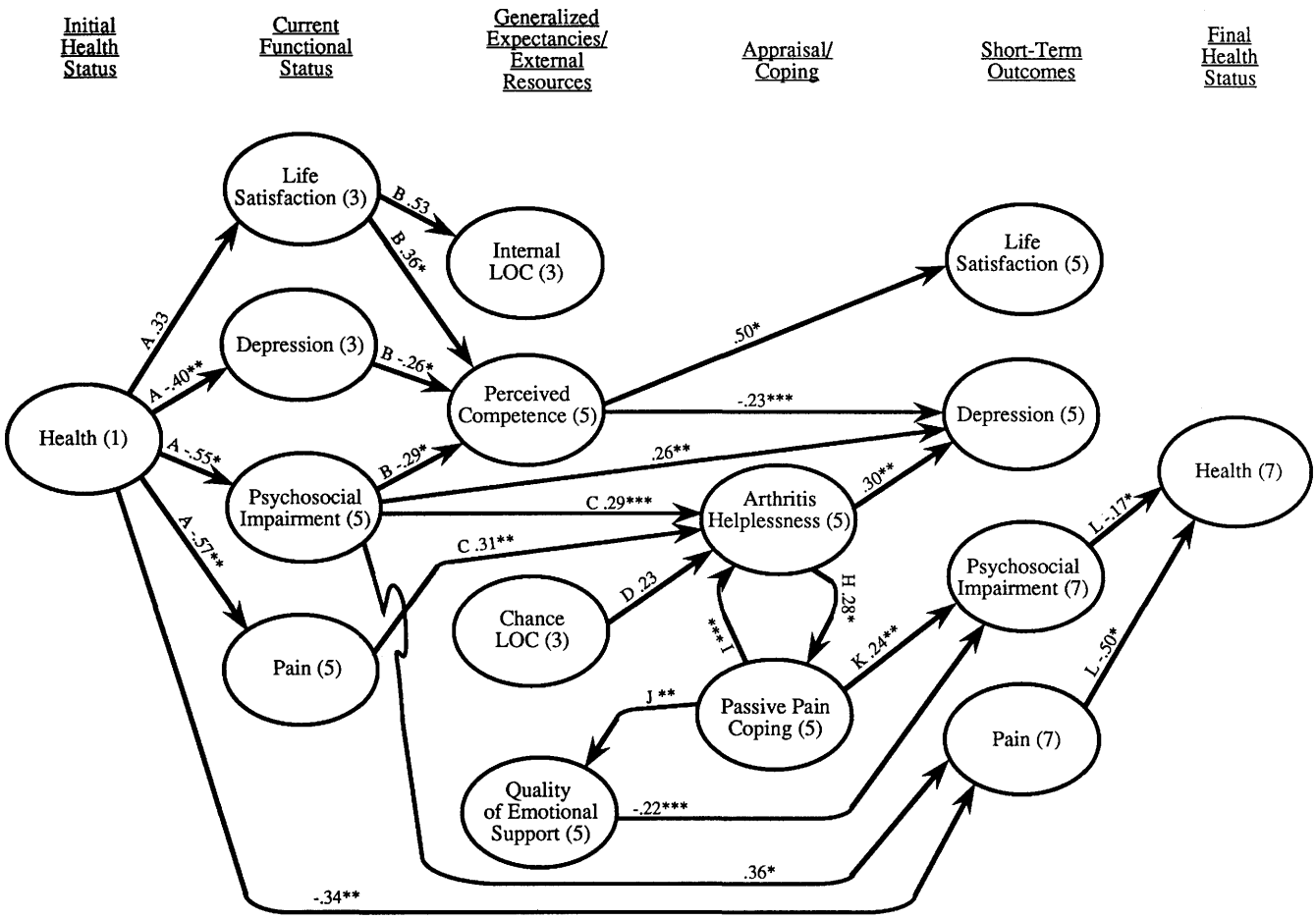

FIGURE 2 Results of the comprehensive path analysis. Only paths significantly different from 0 at $p < .01$ are depicted. The letters labeling the paths correspond to the path labels in Figure 1. Unlabeled paths were not predicted by the theoretical model. The coefficients are standardized regression coefficients, and the asterisks represent the number of times each path was replicated in the prospective dynamic analyses (see Table 2).

average internal consistency (alpha) of .80 for these same measures. Therefore, it is noteworthy that, of the 22 paths revealed by the comprehensive path analysis, all but 3 received additional support in at least one dynamic analysis, and several were supported by two or three of the analyses conducted for that path (see Table 2). Additionally, the relations between passive coping with pain and both perceived quality of emotional support and appraised helplessness, not tested in the main path analysis, were supported.

If only those paths receiving at least some support in the dynamic analyses are considered, two potentially vicious cycles emerge. Neither cycle directly involves the subject's arthritis-related pain, and, thus, both represent possible routes by which individuals experiencing the same degree of pain may come to differ in terms of their overall adaptation to the disease. The first cycle involves perceived competence, life satisfaction, and depression and has been discussed elsewhere (C. A. Smith et al., 1991). The second is considerably more complicated and centers on helplessness appraisals and passive coping with pain. The paths contributing to this latter cycle are schematized in Figure 3.

Helplessness appraisals and passive coping with pain appear to feed on each other so that the presence of one contributes to an increase in the other. In addition, passive coping with pain appears to produce increases in psychosocial impairment both directly and indirectly through its influence on the perceived quality of emotional support. Psychosocial impairment appears to have widespread maladaptive effects involving both cycles. First, as an indicator of current functional status, it appears to reduce perceived competence and to increase depression, thereby contributing to the cycle involving perceived competence. In addition, it contributes directly to increases in helplessness appraisals, thereby completing the cycle involving helplessness, passive coping with pain, and psychosocial impairment. Finally, when considered as a short-term outcome, psychosocial impairment contributes directly to declines in long-term health status.

GENERAL DISCUSSION

Overall, the results of this study support the utility of the stress-and-coping model for understanding adaptation to RA. The model provided considerable guidance in identifying the variables likely to prove important to understanding the processes leading to relatively good or relatively poor adaptation to RA and performed fairly well at predicting the general relations to be observed among these variables. In the main, those variables the model posited to be important in the adaptation process were related to functioning and health in ways that were consistent with the model's predictions.

The specific results of the analyses guided by this model suggest the existence of at least two vicious cycles that promote maladaptation in the face of RA and its associated pain. The results also describe the likely functioning of these cycles. Many of the individual components of these cycles replicate previous findings. For example, consistent with the large body of work on helplessness theory (Abramson et al., 1978), appraisals of arthritis helplessness were found to reliably predict subsequent increases in depression (cf. T. W. Smith et al., 1990; Stein, Wallston, Nicassio, & Castner, 1988); a characteristic style of passively coping with pain was found to predict increases in psychosocial impairment (cf. Brown, Nicassio, & Wallston, 1989; Keefe et al., 1989); and perceived adequacy of emotional social support was consistently found to buffer against psychosocial impairment (cf. Affleck et al., 1988; Brown, Wallston, & Nicassio, 1989; Fitzpatrick et al., 1988).

The close correspondence of the present findings with previous ones increases our confidence in the validity of the described cycles. Moreover, by simultaneously considering the multiple components of the cycles and by examining their dynamic properties as they unfolded over time, the present study goes beyond previous work and begins to depict more explicitly how these variables operate in concert to influence adaptation. The delineation of these cycles also suggests promising points of intervention that might be used to break the cycles in individuals who are faring poorly. The specific relations observed in the present study suggest that interventions designed to bolster a generalized sense of competence and to discourage helplessness appraisals and passive coping strategies in response to pain have the potential to improve the psychological and functional

TABLE 2
Dynamic Analysis of Relations Supported by the Comprehensive Path Analysis

	Waves Defining Period of Prediction			
Path Tested	*1 to 3*	*3 to 5*	*5 to 7*	*7 to 8*
Health status to current functioning				
Health to life satisfaction	—	.11†	.13†	.10
Health to depression	−.15*	−.21**	−.07	−.12
Health to psychosocial impairment	−.47***	−.03	.09	−.05
Health to pain	−.17*	−.18*	.05	−.12
Current functioning to generalized expectancies				
Life satisfaction to Internal LOC	—	.14†[a]	—	—
Life satisfaction to perceived competence	—	.22**	.13†	—
Depression to perceived competence	−.16**	−.11	−.06	—
Psychosocial impairment to perceived competence	−.05	−.16*	−.09	—
Current functioning to appraisal				
Psychosocial impairment to arthritis helplessness	.18**	.19**	.14†	.20**
Pain to arthritis helplessness	.24***	.00	.11	.14*
Generalized expectancies to appraisal				
Chance LOC to arthritis helplessness	—	.03	—	−.01
Generalized expectancies to coping	None			
External resources to appraisal	None			
External resources to coping	None			
Appraisal to coping				
Arthritis helplessness to passive coping with pain	.19***	.13†	.01	—
Coping to appraisal (not tested in path analysis)				
Passive coping with pain to arthritis helplessness	.18**	.23***	.23***	.05
Coping to external resources (not tested in path analysis)				
Passive coping with pain to quality of emotional support	−.14**	−.18**	−.03	−.03
Coping to short-term outcomes				
Passive coping with pain to psychosocial impairment	.27***	.06	.16*	.08
Short-term outcomes to health				
Psychosocial impairment to health	−.04	−.25**	−.15†	−.08
Pain to health	−.13†	−.19*	−.17†	−.15
Influences on outcomes not predicted by general model				
Perceived competence to life satisfaction	—	.04	.22**	.09
Perceived competence to depression	−.24***	−.21*	−.12	−.17*
Arthritis helplessness to depression	.11†	.38***	.14	.19**
Quality of emotional support to psychosocial impairment	−.13*	.00	−.17**	−.14**
Psychosocial impairment to depression	.08	.34***	.01	.21**
Psychosocial impairment to pain	.03	.24**	.06	.09

Notes. The *N*s for the preceding analyses going from Wave 1 to Wave 3, Wave 3 to Wave 5, Wave 5 to Wave 7, and Wave 7 to Wave 8 were 206, 160, 153, and 147, respectively. In each analysis, the independent variable at the start of a particular year was used to predict change in the dependent variable during the year. This prediction was accomplished by examining the relation between the independent variable and the dependent variable after partialing out the dependent variable at the start of the year. Thus, the coefficients depicted in the table are the standardized regression coefficients (βs) for the independent variable in a two-term regression equation in which both the independent variable and the dependent variable from one wave of data are used to predict the dependent variable 1 year later. These analyses were performed to test all paths supported in the comprehensive path analysis, as well as those paths involving coping as an independent variable that were not tested in the path analysis. In each case, the analysis was replicated in each pair of waves containing the necessary data.

[a] This prediction goes from Wave 3 to Wave 7 due to the availability of Internal LOC in only these waves.

*$p < .05$. **$p < .01$. ***$p < .001$. †$p < .10$.

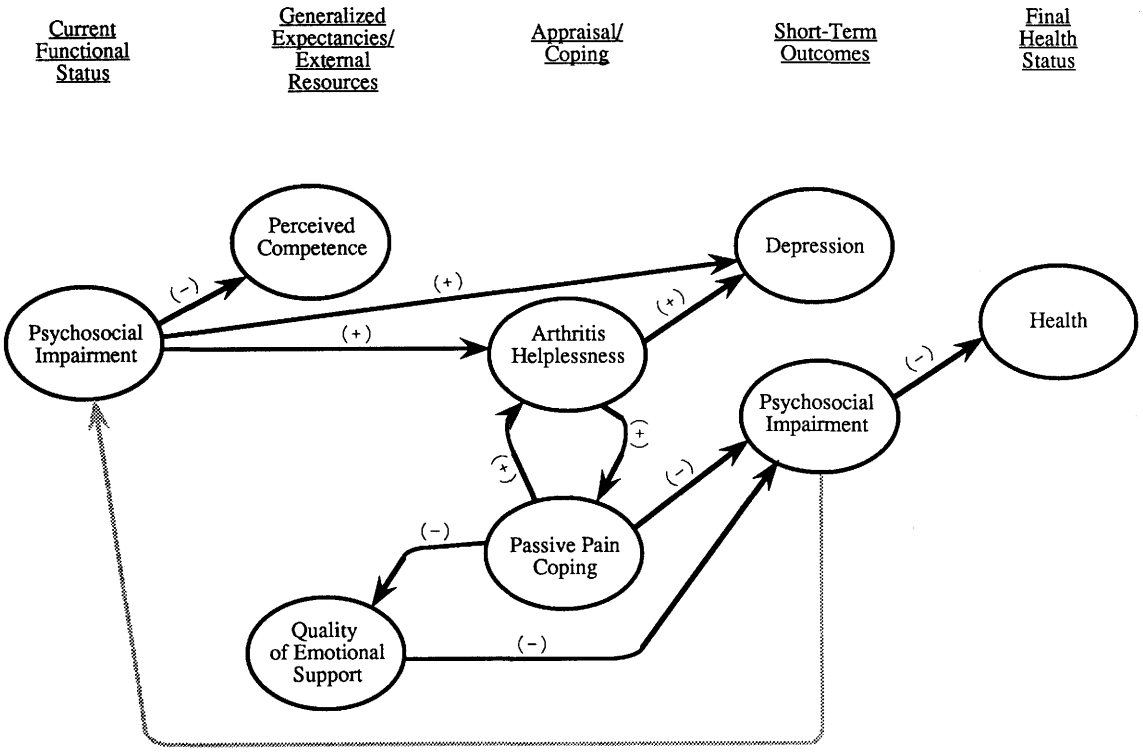

FIGURE 3 Depiction of the vicious cycle involving helplessness appraisals and passive coping with pain that was supported by the dynamic analyses. Only those paths directly relevant to this cycle are depicted. The shaded arrow from psychosocial impairment (as a short-term outcome) to psychosocial impairment (as an indicator of current functional status) indicates that psychosocial impairment serves both functions but at different stages in the cycle.

well-being of individuals facing the chronic pain of RA.

The design and testing of such interventions represent an important future step in examining the processes leading to adaptation and maladaptation. Although the relations we observed are promising, ambiguities remain as to their causal status because the study was observational and no variables were actively manipulated. Further, none of the observed relations was replicated in all the dynamic analyses that examined it, preventing the evidence from being as strong as it might have been. Due to the difficulties inherent in predicting change, particularly in a stable data set like the present one, we view a positive result as more diagnostic than a negative one, and we believe that even a single replication within our analyses provides reasonable support for a given relation. Nonetheless, it is important to replicate each of the observed relations in future work, and attempts to actively manipulate the relevant variables through intervention strategies would provide especially strong evidence for their causal importance.

The present study is subject to additional limitations that should be addressed in future research. For instance, the data were based solely on subjects' verbal self-reports. This raises the possibility that the interrelations among our variables reflect a stable dimension of neuroticism, or "negative affectivity," along which our subjects differed (cf. Watson & Pennebaker, 1989). In addition, it is likely that the reliance on self-report has inflated at least some of the observed relations as a result of shared method variance (Coyne & Gotlib, 1983) because, even though each of the measures utilized in this study was designed to assess a distinct theoretical construct, in several cases individual items used to assess these constructs were similar.

There are grounds for doubting that our findings are solely due to the influence of either a single global trait or shared method variance. First, even though the data were characterized by substantial stability over the 4-year period, there was systematic change in most variables, and our model was able to capture significantly many facets of this change. Second, several of the observed relations demonstrated a specificity and complexity that is difficult to account for by a monolithic trait or by item overlap. For instance, passive coping with pain contributed directly to the prediction of changes in psychosocial impairment, but the reverse did not hold; reports of health status were substantially more strongly linked to pain reports and, to a lesser extent, to reports of functional impairment than they were to reports of life satisfaction or depression; perceived quality of emotional social support was specific in its relation with psychosocial impairment, arguably the most "social" of the short-term outcome measures; and so on.

Nonetheless, it is likely that both trait negative affectivity and shared method variance inflated some of the observed relations, and we believe there is considerable need to supplement studies such as ours with studies that include convergent measures of a more behavioral nature. Use of such measures remains the strongest and most satisfying method of addressing these problems, which are shared by all studies that rely exclusively on self-report measures.

It should also be noted that our findings may have been affected by subject attrition. As we reported, our analyses were based on a subsample that was somewhat healthier than our original sample of subjects. That the intercorrelations among the variables were highly similar for both those subjects who were dropped and those who were retained suggests that the effects of attrition on our findings

were probably minimal. Nonetheless, one possible result of the restricted range in the health of our final sample may have been to attenuate the strength of the observed relations, and future studies employing a more representative sample of arthritis patients may find even stronger evidence for these relations.

In addition, it should be noted that we limited ourselves to examining a "main effects" model and did not consider potential interactions, or moderator effects, among the variables. We did this to keep the examination of an already complex model manageable, and it is important to realize that moderator effects would not necessarily be incompatible with the general theoretical framework. For instance, it is entirely consistent with the framework that both internal and external resources (such as social support) are most heavily utilized and thus contribute most strongly to adaptational outcomes at the most severe levels of disease activity (cf. S. Cohen & Wills, 1985).

Finally, as noted, the present data indicate a need to improve our measures of appraisal and coping and to more closely examine the roles of these processes in adaptation to RA. Our findings confirm the importance of these variables for understanding adaptation to RA, but the observed direct effects of dispositions and social support on short-term outcomes, which were predicted to be mediated through appraisal and coping, suggest that we may have been too restricted in conceptualizing both appraisal and coping. Both variables were represented by very broad and general measures in this investigation. Appraisal was reduced to a single summary dimension, and coping was reduced to two major dimensions. It is necessary to substantially expand and refine the measurement of both constructs and to use the improved measures to examine more systematically their hypothesized roles as central mediators between disease activity and adjustment.

In acknowledging the limitations of the present study and in considering the directions for future research suggested by its findings, it is important not to lose sight of the positive contributions of this work. First, at a general level, the results clearly illustrate the relevance of the stress-and-coping model for understanding adaptation to RA. At a more specific level, the findings point toward the existence of two vicious cycles that appear to promote poor adaptation to RA. Gaining a more complete understanding of these cycles should contribute to the development of effective interventions to improve functioning in individuals who would otherwise experience difficulty in adjusting to this painful disease.

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