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COPING AS A MEDIATOR IN RECOVERY FROM CARDIAC SURGERY

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Recovery from surgery can be facilitated by adaptive coping or it can be inhibited by maladaptive coping. Coping itself can be influenced by personal and social coping resources. Within a longitudinal design, 174 patients undergoing coronary artery bypass graft (CABG) surgery were surveyed before the event and interviewed afterwards. Presurgical personal and social resources, such as optimistic self-beliefs and social support, were examined along with social and ruminative ways of coping in terms of a variety of recovery outcomes. Worry, emotional states, mental activity, and physical activity were chosen as indicators of recovery. It was found that personal and social resources predicted recovery and that coping mediated presurgery resources and postsurgery readjustment. Covariance structure analysis revealed that seeking social support was an adaptive way of coping. It was positively associated with perceived self-efficacy and with recovery indicators, whereas rumination was negatively associated with both resources and outcomes.

KEY WORDS: Coping, stress, self-efficacy, social support, surgery, recovery.

INTRODUCTION

Adjustment to disease depends, among others, on how patients cope with this stressful encounter and in which way they draw upon their coping resources. Recovery from surgery, for example, is facilitated by some resourceful personality characteristics and by some coping preferences (Blumenthal and Mark, 1994; Carver *et al.*, 1993; Jenkins, Stanton, and Jono, 1994; Krohne, Slangen, and Kleemann, 1966; Reifman, 1995; Scheier *et al.*, 1989; Telch and Telch, 1985; Terry, 1992). It has also been demonstrated that social support may facilitate recovery (Fontana, Kerns, Rosenberg, and Colonese, 1989; King, Reis, Porter, and Norsen, 1993; Kulik and Mahler, 1989, 1993). Both personal and social resources exert a beneficial influence on coping with chronic diseases and on the rehabilitation process (Maes and Bruggemans, 1990; Maes, Leventhal, and de Ridder, 1996). However, it is not well understood how the mechanism operates that links resources, coping behaviors, and adjustment. It seems plausible that personal competence and social networks represent distal factors, whereas actual coping operates as a proximal factor that influences more directly the way individuals adjust to adverse circumstances. The present paper examines the possible mediating role of coping strategies by presenting a longitudinal study that considers resources and coping immediately before surgery, and recovery

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indicators a week after surgery. First, the three major constructs of this study, namely coping, self-efficacy, and social support in terms of their association with recovery are described.

Coping with Illness

In a meta-analysis, Suls and Fletcher (1985) have compiled studies that examined the effects of various coping modes on several measures of adjustment. The authors concluded that avoidant coping strategies seem to be more adaptive in the short run with respect to emotional outcomes, whereas attentive-confrontative coping is more adaptive in the long run, promoting problem-solving or preventive actions. Thus, different ways of coping with illness have been found to be more or less adaptive (see also Carver and Scheier, 1993, 1994).

It remains unclear, however, how the specific coping responses of a patient struggling with a disease can be classified into broader categories. Five coping strategies, for example, were identified by Klauer and Filipp (1993) that turned up as dimensions in a factor analysis: (a) social coping (seeking social integration), (b) rumination, (c) denial (threat minimization), (d) turning to religion, and (e) seeking information. These factors were established as subscales of a psychometric inventory that was used in the present study (see also Aymanns, Filipp, and Klauer, 1995). There are many other attempts to reduce the total of possible coping responses to a parsimonious set of coping dimensions such as instrumental, attentive, vigilant, or confrontative coping on the one hand, in contrast to avoidant, palliative, and emotional coping on the other (for an overview see Parker and Endler, 1996; Schwarzer and Schwarzer, 1996; Suls and Fletcher, 1985).

In the present study, shortly before coronary-artery bypass surgery, patients were asked about their ways of coping during the preceding month. This was not restricted to anticipation of surgery, but included general ways of coping with the overall life stress that patients typically experience. The purpose was not to describe a specific reaction to surgery, but to identify more general coping strategies that are characteristic for cardiac patients in their particular life situation. The aim was to examine the role that individual differences in coping might play for the immediate recovery process after surgery. Coping can also be seen as a dependent variable since stable personal and social characteristics can influence the way patients handle stressful encounters. Thus, it is to be explored how relatively stable coping resources may affect coping, and how coping may affect recovery.

Personal Coping Resources: Optimistic Self-Beliefs

Perceived self-efficacy reflects one's belief of being able to master challenging demands by means of adaptive action. It can be regarded as an optimistic view of one's capacity to deal with stress (Bandura, 1992; in press). Patients with high efficacy beliefs, for example, are better able to control pain than those with low self-efficacy (Altmeyer, Russell, Kao, Lehmann, and Weinstein, 1993; Litt, 1988; Manning and Wright, 1983). Self-efficacy has been shown to affect blood pressure, heart rate and serum catecholamine levels in coping with challenging or threatening situations (Bandura, Cioffi, Taylor, and Brouillard, 1988; Bandura, Reese, and Adams, 1982; Bandura, Taylor, Williams, Mefford, and Barchas, 1985). Cognitive-behavioral treatment of patients with rheumatoid arthritis enhanced their efficacy beliefs, reduced pain and joint inflammation, and improved psychosocial functioning (Holman and Lorig, 1992; O'Leary, Shoor, Lorig, and Holman, 1988; Smith, Dobbins, and Wallston, 1991; Smith and Wallston, 1992). Optimistic self-beliefs have turned out to be influential in the rehabilitation of chronic obstructive pulmonary disease patients (Kaplan, Atkins, and Reinsch, 1984; Toshima, Kaplan, and Ries, 1992).

Recovery of cardiovascular function in postcoronary patients is similarly enhanced by beliefs in one's physical and cardiac efficacy (Ewart, 1992, 1995). Presurgery optimism has been found beneficial, for example among cancer patients (Carver *et al.*, 1993; Friedman *et al.*, 1992) and heart patients (Fitzgerald, Tennen, Affleck, and Pransky, 1993; Scheier *et al.*, 1989).

Dispositional optimism (Scheier and Carver, 1985) is a similar theoretical construct pertaining to a positive outlook on the future. Perceived self-efficacy, however, pertains explicitly to one's personal coping resources. Thus, the synonymous label "optimistic self-beliefs" that Bandura has introduced (Bandura, 1992; *in press*) denotes that perceived self-efficacy represents a narrower and more explicit concept of optimism than the broader one proposed by Scheier and Carver (1985). Optimistic self-beliefs refer to personal agency in challenging encounters. They reflect the "can do" cognition whereas optimism rather reflects that "good things will happen". Generalized optimistic self-beliefs are assessed with psychometric scales that might overlap with other optimism measures (Schwarzer, Bäßler, Kwiatek, Schröder, and Zhang, 1997). Situation-specific perceived self-efficacy, however, is usually measured by one or a few items that address the particular behavior under study. Magnitude, certainty, and generality are facets of construct operationalization with the latter facet being the one that is addressed here. (For a review of the relationship between optimism and health, see Bandura, *in press*; Peterson and Bossio, 1991; Maddux, 1995; Scheier and Carver, 1992; Schwarzer, 1994).

Social Coping Resources: Perception and Receipt of Support

Social support can assist coping and can exert beneficial effects on various health outcomes (Schwarzer and Leppin, 1989, 1991). Social support has been defined in various ways, for example, as "resources provided by others" (Cohen and Syme, 1985), as "coping assistance" (Thoits, 1986), or as an exchange of resources "perceived by the provider or the recipient to be intended to enhance the well-being of the recipient" (Shumaker and Brownell, 1984, p. 13). Several types of social support have been investigated, such as instrumental support (e.g., assist with a problem), tangible support (e.g., donate goods), informational support (e.g., give advice), or emotional support (e.g., give reassurance), among others. The definition and measurement problems evolving in studying the social support construct, however, have remained an issue for debate (Dunkel-Schetter, and Bennett, 1990; Kessler, 1992; Pierce, Sarason, and Sarason, 1996; Schwarzer, Dunkel-Schetter, and Kemeny, 1994; Turner, 1992; Vaux, 1992).

Social support has been found advantageous for recovery from surgery among heart patients. Kulik and Mahler (1989) have studied men who underwent coronary-artery bypass surgery. Those who received many visits by their spouses were, on average, released somewhat earlier from hospital than those who received only few visits. In a longitudinal study, the same authors also found positive effects of emotional support after surgery (Kulik and Mahler, 1993). Similar results were obtained by other researchers (Fontana *et al.*, 1989; King *et al.*, 1993), but little is known about the effects of social support on patients' coping responses, and whether coping operates as a mediator of social resources on readjustment.

Research Questions

The aim of the present study is to explore the role of resource factors and coping strategies in recovery from surgery in a sample of patients who underwent coronary-artery bypass graft (CABG) surgery. First, the correlations between coping and recovery

outcome variables are examined. Second, the joint influence of resource factors and coping strategies on readjustment is studied. The interplay of optimistic self-beliefs, social support, and coping is specified as a structural model with resources as distal antecedents and ways of coping as proximal antecedents of the readjustment process. Personal and social resources are seen as relatively stable and distal factors that may influence the way how people cope with adversity in life. Coping itself is considered to be of proximal importance for the pace of recovery. Thus, coping has been assigned the role of a mediator between resource factors and recovery outcome indicators.

METHOD

Design and Procedure

The study used a longitudinal design with two points in time, once just before the surgery, and again about one week after surgery. Patients were contacted upon arrival at the cardiac surgery ward of the Charité Hospital Berlin and were asked to participate in the study. They were briefed very generally about the research, the purpose of which was declared as an "investigation on the effects of severe cardiac disease and surgery on the quality of life." The patients were assured that the data would be computerized anonymously and that participation was voluntary. They received a questionnaire to be placed into a box that was available on the ward for that purpose, as soon as possible (Wave 1).

Patients were approached for the interview not earlier than five days and not later than ten days after surgery (Wave 2). In those cases where patients were unable to be interviewed (e.g., due to poor physical condition), further attempts to obtain interview data were made in the subsequent days until discharge from hospital. The postsurgery interview took about half an hour. It included oral questions about physical and mental well-being, and activities such as sitting up in bed or ambulating.

Participants

Those who had responded to the presurgery questionnaire represented the initial sample of 381 patients (302 men, 79 women). The postsurgery interview was completed by a subsample of 248 patients (193 men, 55 women). The attrition rate was 35.5% for the following reasons: 19.4% ($n=74$) were referred to different hospitals early after surgery, 5.8% ($n=22$) passed away, 5.5% ($n=21$) did not undergo surgery, and 4.5% ($n=17$) were unwilling to be interviewed. More men (82.46%) than women (34.5%) had a life partner. A myocardial infarct had been experienced by 35% of the patients, and two infarcts by 6.4%. Of the men, 48.1% were retired or jobless, of the women 26.1% fell into this category.

Coronary-artery bypass graft (CABG) surgery was performed on 152 of the 193 men and on 26 of the 55 women ($n=178$). The others underwent different kinds of heart surgery, with most patients having been scheduled for cardiac valve substitution, heart transplantation, removal of heart tumors, or aneurysm resection. The present analyses were performed with the sample of those 174 CABG patients for whom complete data were available. This subsample was chosen to avoid any confound with characteristics that pertain to different kinds of surgery. There were 148 men with a mean age of 60 years ($SD=8.6$; range: 37 to 76 years), and 26 women between 49 and 77 years (mean = 62 years, $SD=7.7$).

Measures at Time 1 (before surgery)

The first three of the following instruments, measuring self-efficacy and social support, were administered at Time 1. To assess the personal resource factor, a German version of the Generalized Self-Efficacy scale was used (Schwarzer *et al.*, 1997; Schwarzer and Jerusalem, 1995). This ten-item inventory was designed to assess *optimistic self-beliefs*, not reflecting situation-specific perceived self-efficacy (Bandura, 1992), but rather a dispositional and general personality dimension. Sample items are: "I can always manage to solve difficult problems if I try hard enough," and "I can remain calm when facing difficulties because I can rely on my coping abilities." Responses were made on a four-point Likert scale, ranging from 1 (*not at all true*) to 4 (*exactly true*). The internal consistency for this inventory was Cronbach's $\alpha = 0.82$.

To assess a social resource, the *social support* scale by Donald and Ware (1982, 1984) was used in its German adaptation by Bullinger and Kirchberger (Kirchberger, 1991; Westhoff, 1993). This inventory, which is composed of 19 items that aim at the perceived availability of instrumental, emotional and informational support, is particularly tailored to patients. Sample items are: "Is there anyone (a) who would help if you were ill in bed," (instrumental), (b) "who would hug you," (emotional), and (c) "whose advice is really important?" (informational). Responses were made on a five-point Likert scale, ranging from 1 (*never*) to 5 (*always*). The internal consistency for the 19-item scale was Cronbach's $\alpha = 0.96$.

Coping was measured by a German questionnaire, the Trier Scales of Coping With Disease (Trierer Skalen zur Krankheitsbewältigung, TSK; Klauer and Filipp, 1993). This inventory was chosen because it is a well-validated German measure for patient samples. The 37-item instrument is subdivided into five subscales, based on factor-analytically derived dimensions: (a) Social Coping (seeking social integration; $\alpha = 0.76$), (b) Rumination ($\alpha = 0.80$), (c) Threat Minimization (denial; $\alpha = 0.76$), (d) Turning to Religion ($\alpha = 0.79$), and (e) Seeking Information ($\alpha = 0.85$). Responses were made on a six-point Likert scale, ranging from 1 (*never*) to 6 (*very often*). Only two of these five subscales, namely Rumination and Social Coping, turned out to be of value in the subsequent analyses (see below). The *Social Coping* subscale describes a way of coping by seeking social embeddedness and support. It consists of nine items such as "I went out with friends" and "I have visited people or invited others to visit me." The *Rumination* subscale describes a particular way of coping such as thinking about past times, searching for causes of the disease, and focussing on ambiguity. It consists of nine items such as "I have thought about better times in the past" or "I have thought about other people who obviously enjoy a trouble-free life".

Measures at Time 2 (approximately one week after surgery)

Postsurgery activity levels were measured by interview questions: Two questions referred to reading, i.e., one to its frequency, and the other one to the point in time when patients resumed reading after surgery. Small numbers of the latter pertain to a shorter time period, thus indicating a higher activity level which, in turn, can be seen as an indication for earlier recovery. The correlation between reading frequency and time of resumption of reading was -0.56 . Two more variables referred to the extent of physical activity after surgery: First, ambulating in the hospital ward ("Do you ambulate frequently in the ward [for example, to see others or to talk with others]?") and attempts to stay physically fit ("Do you already try to stay fit [how often]?"). Their intercorrelation was 0.40 .

Emotions were measured by the Profile of Mood States (POMS), a 35-item adjective checklist (McNair, Lorr, and Droppleman, 1971) in its German version by Bullinger, Heinisch, Ludwig, and Geier (1990). It includes subscales to assess dysphoric mood (7 items, Cronbach's $\alpha = 0.78$), fatigue (7 items, Cronbach's $\alpha = 0.87$), sadness (14 items, Cronbach's $\alpha = 0.85$), and energetic mood or vigor (7 items, Cronbach's $\alpha = 0.87$).

Worries were assessed with four items asking for: (a) rumination after surgery, (b) concerns that the disease symptoms could reoccur, (c) worries about failure to return to former physical standards, and (d) concerns about having a myocardial infarct or reinfarct in the future. These four items were used as single indicators, but they were also summed up to yield a total worry scale. Its internal consistency was Cronbach's $\alpha = 0.73$.

RESULTS

All independent and dependent variables were scrutinized for any relationship with medical variables such as number of bypasses, number of myocardial infarcts, amount of prescribed medication etc.. No significant associations were found. Therefore, medical indicators were not included in the subsequent analyses. Descriptive statistics of the variables involved are displayed in Table 1. Gender differences were found for three variables. Women reported fewer reading activities, i.e., they read less and resumed reading only on the fourth day after surgery (mean = 3.65 days) whereas men resumed reading on average one day earlier (mean = 2.7 days). Men reported more efforts to regain their physical fitness than women. Women also had a stronger tendency to turn to religion than men.

Associations between Coping, Presurgery Resources and Postsurgery Recovery

The five coping dimensions were correlated with presurgery resources (Table 2). Self-efficacy was significantly related to denial (0.28) and social coping (0.40), whereas social

Table 1 Descriptive scale statistics and test of gender differences

Variable	Men			Women			F	p	eta ²
	M	s	n	M	s	n			
Self-efficacy	30.50	4.35	142	28.65	5.53	26	3.63	0.06	0.02
Social support	86.54	11.84	147	82.52	14.01	25	2.33	0.13	0.01
Denial	37.98	5.19	145	38.65	4.75	26	0.37	0.54	0.00
Info-Seeking	28.12	7.88	143	28.37	7.41	23	0.02	0.89	0.00
Religion	5.25	3.10	144	6.96	4.84	23	5.07	0.03	0.03
Ruminating	27.91	7.61	143	28.71	8.19	24	0.22	0.64	0.00
Social coping	34.09	6.68	144	34.72	7.87	23	0.17	0.68	0.00
Reading	2.91	1.17	147	2.32	1.25	25	5.36	0.02	0.05
Resume reading	2.70	1.37	119	3.65	2.08	20	7.01	0.01	0.03
Ambulating	2.85	1.17	147	2.48	1.19	25	2.09	0.15	0.01
Fitness	3.09	1.01	143	2.64	1.11	25	4.20	0.04	0.02
Depression	16.32	3.75	146	17.81	6.18	26	2.76	0.10	0.02
Energy	14.86	5.44	146	14.12	5.71	26	0.40	0.53	0.00
Worry	6.67	3.00	147	7.12	3.17	26	0.49	0.49	0.00
Symptoms	36.32	8.78	148	36.39	7.06	26	0.00	0.97	0.00

Table 2 Correlations of five coping-styles with social and personal resources and recovery at time 2

	<i>Denial</i>	<i>Information seeking</i>	<i>Religion</i>	<i>Rumination</i>	<i>Social coping</i>
<i>Resources</i>					
Self-efficacy	0.28**	0.03	0.08	-0.11	0.40**
Social support	0.10	-0.05	-0.14*	-0.21**	0.19**
Symptoms	-0.23**	0.06	-0.01	0.09	-0.16*
Days in intensive care	0.06	0.11	0.13	0.16*	0.14*
Fitness	0.05	0.07	-0.03	-0.07	0.15
Ambulating	0.07	-0.07	-0.01	-0.07	0.17*
Reading	0.13	-0.06	-0.09	-0.06	0.19*
Resume reading	0.04	0.01	0.11	0.11	-0.17*
Resume walking	-0.03	0.22**	0.09	0.16*	-0.01
Resume sitting up in bed	-0.08	0.06	-0.05	0.09	-0.02
Resume visits	0.13	0.04	0.20*	0.16*	0.04
Worry infarct	0.04	0.06	0.09	0.22**	0.00
Worry function	-0.01	-0.00	0.01	0.22**	-0.05
Worry symptom	-0.01	0.07	0.07	0.31**	-0.10
Worry general	-0.05	0.11	0.14	0.28**	-0.12
POMS-tiredness	-0.13	-0.01	-0.08	0.07	-0.11
POMS-anger	-0.16*	-0.01	-0.13	-0.03	-0.08
POMS-depression	-0.12	0.06	0.04	0.26**	-0.19*
POMS-energy	0.21**	-0.01	-0.01	-0.23**	0.30**

Note. * $p < 0.05$, ** $p < 0.01$; POMS = Profile of Mood States.

support was related to turning to religion (-0.14), rumination (-0.21), and social coping (0.19). Social coping is the only dimension that was related to both resources, in particular to self-efficacy.

The five coping dimensions were also related to some of the recovery indicators after surgery (lagged correlations). Denial, for example, was associated with less symptoms (-0.23) and more energetic mood at Time 2 (0.21). Information Seeking was only related to the resumption of walking, i.e., the tendency to seek information was more prevalent in those who hesitated to ambulate in the ward. Equally weak was the association of turning to religion with all recovery indicators. Only two coping dimensions, namely rumination and social coping, were related to a large number of recovery and readjustment indicators. Thus, for subsequent advanced analyses, the former three coping dimensions were no longer considered.

A Structural Model to Examine the Mediator Role of Coping

From the correlation matrix, there is evidence that the presurgery stress resources are related to the postsurgery recovery indicators. Theoretically, it is plausible to assume more resourceful patients to cope in a more adaptive manner than less resourceful patients. Thus, coping could be a mediator of resources and recovery. The mediator model includes two resource factors (self-efficacy and social support) as distal predictors of indirect influence, and two coping factors (rumination and seeking support) as proximal factors that might influence recovery more directly.

The computations were performed using the LISREL 8 program (Jöreskog and Sörbom, 1993), based on a correlation matrix that was created with listwise deletion of missing values ($n=123$). The parameters were estimated with the unweighted least square method.

The model fit the data with chi-square = 171.04 (216 *df*, $p = 0.99$), a goodness of fit GFI = 0.96, and an adjusted goodness of fit AGFI = 0.95. The root mean square residual was RMR = 0.07. The final model is presented in Tables 3 and 4 and Figure 1 (completely standardized solution). Before describing the resulting coefficients a word of caution is necessary. In structural equation modelling it is convenient to obtain a “standardized solution” in order to have path coefficients that range from zero to one. The standardized coefficients, however, do not correspond to product-moment correlations or beta weights

Table 3 Results of the LISREL analysis (Completely standardized solution of measurement model)

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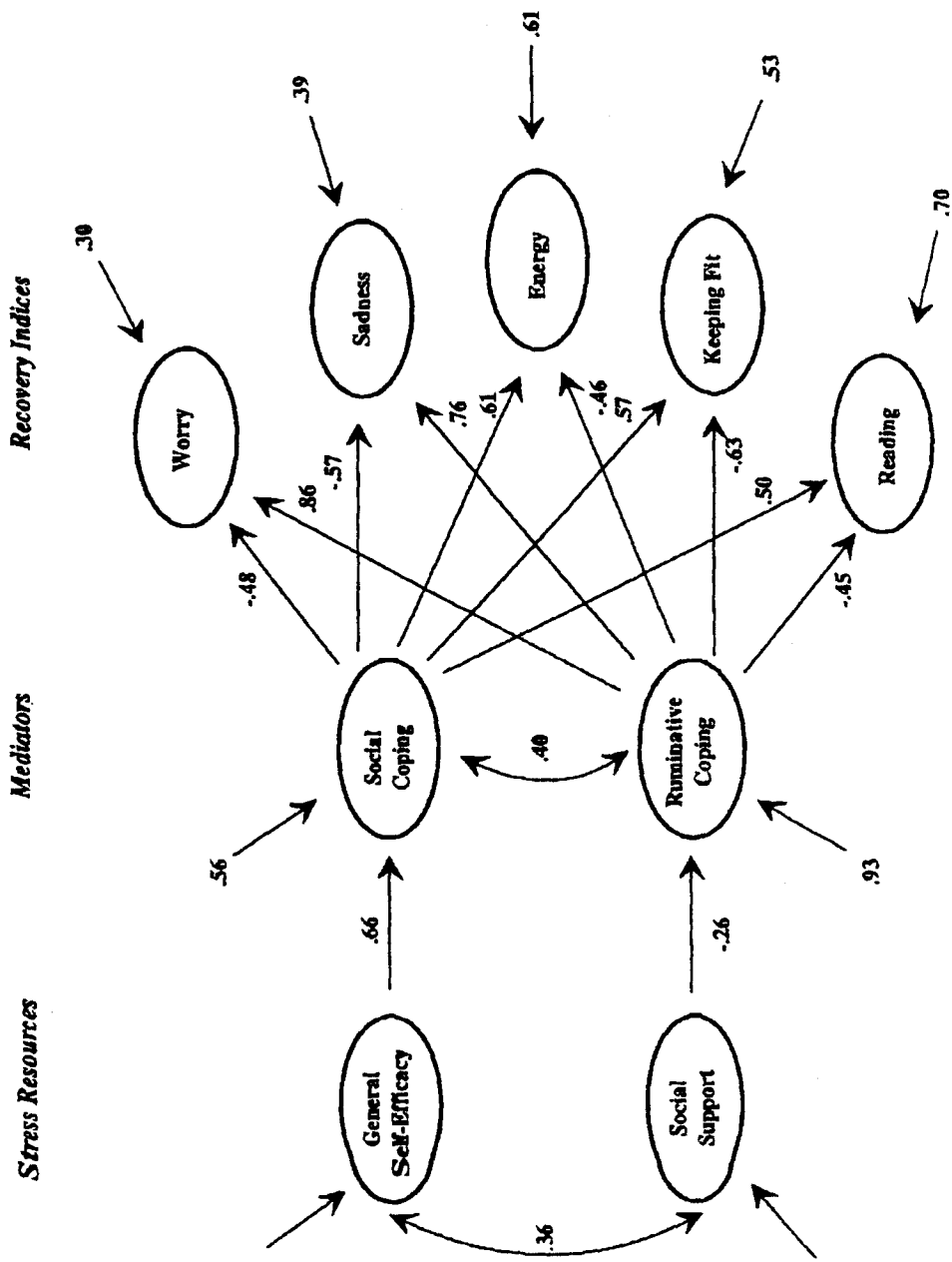


Figure 1 Coping as a mediator of resource factors and recovery factors.

Table 4 Results of the LISREL analysis (Completely standardized solution of the structural model)

	<i>Beta-coefficients</i>			
	<i>Self- efficacy</i>	<i>Support</i>	<i>Coping ruminate</i>	<i>Coping social</i>
Rumination	–	–0.26	–	–
Social coping	0.66	–	–	–
Worry	–	–	0.86	–0.48
Depression	–	–	0.76	–0.57
Energy	–	–	–0.46	0.61
Fitness	–	–	–0.63	0.57
Reading	–	–	–0.45	0.50

derived from other computations, that is, latent variables can be interconnected by high path coefficients although the underlying observed correlation matrix contains only low associations. There are two reasons: (a) Pathes among latent variables are free of measurement error, and therefore higher than those among manifest variables that are strained by measurement error; (b) The standardization procedure is based on the “Etas”, i.e., the endogenous latent variables with the aim to allow for a straightforward comparison between the pathes within one single model. The trade-off is that a comparison with coefficients outside this model is impaired. Unstandardized solutions are, therefore, when it comes to comparing results from more than one model. In the present situation of one single model, the standardization appears to be most convenient if one keeps in mind that the numbers do not reflect actual effect sizes.

Social coping has considerable direct effects on Worry (–0.48), Sadness (–0.57), Energy (0.61), Keeping Fit (0.57), and Reading (0.50). Rumination has direct effects on Worry (0.86), Sadness (0.76), Energy (–0.46), Keeping Fit (–0.63), and Reading (–0.45).

The more important question is whether there are direct and indirect effects of the two distal resource factors. A respecified model with direct effects did not improve the model fit, although the direct pathes from Self-Efficacy and Social Support to the recovery factors were considerably high. Thus, the mediator model was confirmed as one model among others. It cannot be proven that the mediator model is the only valid one, but it has been demonstrated that all other plausible models, including the direct-resource-effect model, are not superior. Table 5 displays the indirect effects the two resource factors made by means of the two mediators. The indirect effect of Self-Efficacy was –0.32 on worry, –0.38 on sadness, 0.40 on energetic mood, 0.38 on fitness, and 0.33 on reading. The indirect effect of Social Support was –0.22 on worry, –0.19 on sadness, 0.12 on energetic mood, 0.16 on fitness, and 0.11 on reading. Indirect effects are equal to total effects in this case because no direct paths were specified between resources and recovery.

There were no significant cross-over effects of the two distal resources to the mediating coping factors. This is partly due to the intercorrelation of the two resources. The unbiased intercorrelation between the two resource factors was 0.36, which is high compared to the biased correlation between the self-efficacy and the support scales of 0.25 (see manifest variables in Table 2). The two coping factors were also considerably interrelated (0.40), although their intercorrelation at the raw score level was only $r = 0.16$. Measurement errors have probably masked the effects at the level of manifest variables.

Table 5 Standardized indirect effects of resources on recovery

	<i>Self-efficacy</i>	<i>Support</i>
Worry	−0.32	−0.22
Sadness	−0.38	−0.19
Energy	0.40	0.12
Fitness	0.38	0.16
Reading	0.33	0.11

The set of distal and proximal predictors explained a great deal of the variance in the five recovery factors, namely 70% of worry, 61% of sadness, 39% of energetic mood, 47% of fitness efforts, and 30% of reading activities. Almost no variance of Rumination (7%) was accounted for by resources, whereas 44% of Social Coping was accounted for. Thus, Social Coping is the main mediator in the present study, and Self-Efficacy is the main distal predictor of coping and adjustment. In sum, coping did mediate the effects of resources on recovery. In particular, the indirect effects of Self-Efficacy were of major importance.

DISCUSSION

In the present study, coping and coping resources have been found to be important for heart patients who underwent surgery. The research design included two points in time, with surgery in between. Thus, there is some justification to make tentative causal inferences when predicting postsurgery variables from presurgery variables. Due to the nature of the study, the inclusion of an untreated control group as well as randomization were not feasible.

Recovery can be facilitated or inhibited by the use of particular coping strategies or coping preferences such as social coping or rumination. While resources are perceived as distal predictors, coping is seen as a more proximal predictor of postsurgery behaviors, and thus as a mediator. The present results are in line with this assumption, although other equally valid causal models might exist.

The causal model pointed to a superiority of the optimistic self-beliefs over social support when both resources were specified as exogenous latent variables. The support factor was linked to one mediator only, namely Rumination, whereas the self-beliefs factor exerted a strong influence on the other mediator, Social Coping. The five recovery factors were predicted not only by coping, but also indirectly by the presurgery resources, namely optimistic self-beliefs and social support. However, while the indirect influence of self-beliefs was very strong, the one of support was only weak.

The particular role of social coping in this context requires some comment. It might appear to look counterintuitive at first glance that social coping was better predicted by perceived self-efficacy than by social support. It took a place that is usually reserved for the construct of problem-focussed or instrumental coping. The clue is that the active mobilization of one's support system is indeed an instrumental way of coping when one is ill. When there is no opportunity to "fix the problem", energizing one's social resources becomes the second line of defense. Mobilizing social support is seen here as a distinct coping strategy, but actually it can serve a number of purposes, for instance solving a problem, obtaining information, calming down, or distracting oneself with the help of

friends. In the present study, the evidence is in favor of the view that social coping might be an active and problem-directed behavior. Although some content of the questionnaire items allude to the possibility of social diversion, the overall relationships among the variables point to social coping as an adaptive and task-oriented behavior. It is positively related to the recovery indicators, and it is positively determined by agency beliefs (e.g., self-efficacy). The finding that social coping is not related to perceived social support but rather to optimistic self-beliefs underscores the notion of the active and instrumental nature of the social coping construct, which includes network mobilization efforts. Unfortunately, the present data do not allow for a closer examination of the genuine nature of support. It might also be that the more active and optimistic patients do not feel a need to be supported. The social coping items reflect active participation in everyday life, and it remains unclear whether the label of "coping" is appropriate for it. In the broadest sense, stress and coping are part of our daily lives, and whether certain behaviors are adaptive in general or serve recovery in particular, cannot be decided.

Thus, the more general question is whether the social coping construct has been conceptualized at the appropriate level within a system of possible coping concepts. Social support is a multidimensional construct in itself (Schwarzer and Leppin, 1991). For example, instrumental support may assist in problem solving, emotional support may comfort the person, and so on. Most coping inventories include a scale to measure seeking social support or its mobilization, but it has not been a found stable, replicable factor. Carver, Scheier, and Weintraub (1989) have accounted for this problem in their COPE scale by establishing separate social support factors for a problem-focus and an emotion-focus. Parker and Endler (1992) argue that social support should not be conceived of as a distinct coping dimension, but as social resources that may be available for a number of different coping strategies. They suggest to drop it from the category "coping strategies" and to add it to the category "coping resource." Moreover, they discredit support seeking as a subcategory of avoidant coping. According to their theory, coping can be subdivided into task-focus, emotion-focus, and avoidance. The latter is reflected by engaging in a substitute task (distraction) or by seeking out other people (social diversion), both being ways to avoid further stress (Parker and Endler, 1996). The authors acknowledge that a social network can be a resource, but they deny that seeking social support represents an active or instrumental way of coping as most other authors suggest (Carver *et al.*, 1989; Hobfoll, Freedy, Green, and Solomon, 1996).

Illness severity turned out to be of no importance within the framework of the present analyses. No associations were found with the number of bypasses, the number of myocardial infarctions, or any other medical variable. This may have to do with the particular focus on correlations and structural modelling. The aim was not to examine absolute levels of resources, of coping, or of outcomes but rather their potential mediating relationships. The latter has turned out to be unaffected by medical variables which does not necessarily mean that illness severity is without importance in the life of the patient.

Caution is necessary to avoid overgeneralizations. First, it is unclear whether the observed effects are specific for heart patients, most of whom were men in this study. Research with other samples of patients are needed to replicate the findings. Second, there were only two points in time and no opportunity to assess microlevel coping information during the first days after surgery. Third, only two out of five coping subscales were related to resource factors and outcome variables, and these two cannot be representative for the entire host of coping strategies that were actually applied by patients.

Moreover, there is a general problem in assessing coping, and even the most advanced psychometric tools are of limited validity due to conceptual deficits in terms of stability, generality, and dimensionality (Schwarzer and Schwarzer, 1996). It is possible that (a) day-to-day measurement, (b) more situation-specific coping items, and (c) other coping dimensions would have been more appropriate to assess the ongoing stress encounters and to endorse the mediating role than the present variables.

Nevertheless, this study lends some support to the assumption that psychological coping resources lead to particular ways of coping that, in turn, facilitate or inhibit recovery of cardiac patients after surgery. More evidence is needed to explore the actual coping behaviors that serve as mediators in this process. In particular, it is necessary to learn about the patient-spouse interaction and the resourcefulness of the spouse. It has been found that spouses who harbor optimistic self-beliefs and who are themselves socially well-embedded seem to transfer their strength to the patients (Clark and Stephens, 1996; Johnson, Hobfoll, and Zalcberg-Linetzky, 1993). Research on this social aspect of the coping process requires a shift from the individual to the dyad as the unit of analysis, or even as the unit of observation.

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