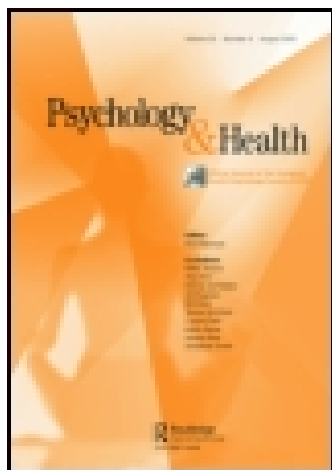


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THE ROLE OF OPTIMISM AND SENSE OF COHERENCE IN PREDICTING RECOVERY FOLLOWING SURGERY

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Two health promoting personality variables, optimism and sense of coherence, were investigated for their ability to predict surgical recovery. A range of positive and negative aspects of recovery following elective surgery for joint replacement were monitored in a group of 57 patients (30 male and 27 female) in a regional New Zealand hospital. Data were collected one or two days prior to surgery, a few days after surgery, and again at a six-week post-surgery check. Surgeons also rated patients' recovery. Both patient and surgeon ratings showed substantial improvement following surgery. Patients reported significantly less pain and distress, and increased positive well-being and self-rated health. Sex differences were found in reported levels of these variables, but not in recovery rates. Optimism and sense of coherence were found to predict improvement in positive aspects of recovery after controlling for pre-surgery levels. Coherence was found to be a more important predictor than optimism in this context. However these personality factors did not predict improvement in distress or pain. Mechanisms linking personality factors to surgical recovery are discussed.

KEY WORDS: Surgery, psychological well-being, self-rated health, pain, optimism, sense of coherence.

Surgery is widely regarded as a stressful event for most patients, and is a life experience with highly salient positive and negative aspects (O'Hara, Ghoneim, Hinrichs, Mehta and Wright, 1989). Psychological variables seem to play an important role in the rate at which patients recover following an operation (Cohen and Lazarus, 1973; George, Scott, Turner and Gregg, 1980; Schultheis, Peterson and Selby, 1987).

Recent evidence suggests recovery from surgery may not be a unitary process. Different indices of recovery have been found to intercorrelate at relatively low levels (Wilson, 1981). Johnston (1984) has argued for the need to consider recovery as multifaceted, and in particular for positive aspects of recovery to be considered.

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In a study examining the recovery of women patients from gynaecological surgery, she found that recovery was not unitary, and could be best conceptualised by three factors, positive well-being, psychological distress, and attitudes towards the hospital. Further, she found some evidence for differences in patient recovery between factors, and for these factors to be predicted by different pre-surgery variables.

Psychological indices of recovery that have been utilised in surgery outcome research have largely tended to be negative, with researchers focusing on such things as pain levels (Taenzer, Melzack and Jeans, 1986), postoperative anxiety (Jamieson, Parris and Maxson, 1987), mood disturbance (Kiyak, Vitaliano and Crinean, 1988), and psychological distress (Anderson, 1987; O'Hara *et al.*, 1989).

Research examining psychological variables that influence the recovery process has also focused predominantly on pathological factors that inhibit recovery. Anxiety has been the most extensively researched in this area and has been found to be associated with a poor recovery from surgery (George *et al.*, 1980; Jamieson *et al.*, 1987; Johnston, 1980). Other research has focused on patients' expectations (Kiyak *et al.*, 1988), social support (Kulik and Mahler, 1989) and presurgical preparation (Anderson, 1987; Ridgeway and Mathews, 1982; Schultheis *et al.*, 1987) as beneficial influences on recovery.

Little research has examined positive psychological factors that may speed patients' recovery following surgical operations. Two variables of this type that have attracted recent interest for their association with health outcomes are personal optimism and sense of coherence. Optimism has been associated with a faster rate of physical recovery and return to normal life activities in a study of recovery following coronary artery bypass surgery (Scheier *et al.*, 1989). Kiyak *et al.* (1988) found that patients who were more optimistic and anticipated fewer problems with surgery reported better psychological outcomes than patients who anticipated numerous problems. Reker and Wong (1983) found that elderly people classified as optimists reported fewer physical health symptoms at a two-year follow-up. Scheier and Carver (1985) also found optimism to be negatively correlated with symptoms, both concurrently and prospectively. The prospective association, over four weeks, was sustained when initial symptom levels were partialled out. Further support for the role of optimism and health outcomes is provided by studies that examine the obverse of optimism, namely pessimism. A pessimistic explanatory style has been found to be associated with increased reports of illness (Peterson and Seligman, 1987), to predict poor health in a 35 year follow-up study (Peterson, Seligman and Vaillant, 1988), and to be associated with lowered immunocompetence (Kamen-Siegel, Rodin, Seligman and Dwyer, 1991). Peterson and Bossio (1991) provide a recent review of the links between optimism, pessimism, and health.

Drawing from their model of behavioural self-regulation, Scheier and Carver (1987) propose two mechanisms to explain the relation between optimism and health outcomes. First, optimists have been found to engage in more adaptive problem focused coping strategies (Scheier, Weintraub and Carver, 1986). Secondly, they may be more persistent in keeping up behaviours helpful to their recovery or health since they see the outcome as likely to be positive.

Sense of coherence is a personality construct proposed by Antonovsky (1979, 1987) to be related to good health and effective coping. Sense of coherence is composed of three dimensions: meaning, manageability and comprehensibility. Meaning is the extent to which individuals see their life as having some purpose and that life tasks are worthy investments. People with high manageability see themselves as hav-

ing the resources to cope with the demands they encounter. Comprehensibility is the extent to which the world is perceived as making sense and being understandable. To date, the relationship between sense of coherence and physical health outcomes has been assessed only in a small number of studies (Antonovsky, 1983; Dana, 1985; Petrie and Azariah, 1990; Williams, 1990).

Although limited empirical work has been conducted with the construct, Antonovsky (1987) considers that perceiving the world as coherent is a pervasive and enduring disposition influencing all aspects of functioning. Coherence is considered to be involved in managing stress and tension, and to relate to coping processes. The link between coherence and health outcomes may therefore operate in similar ways to optimism, with people high in coherence choosing more adaptive coping mechanisms.

The present study investigated the ability of these two constructs, personal optimism and sense of coherence, to predict recovery in a group of patients undergoing elective joint replacement surgery. In view of Johnston's (1984) arguments, assessment of the recovery process included a broad range of outcome variables involving both positive and negative aspects of recovery.

METHOD

Participants

The participants were 57 patients, 30 males and 27 females, undergoing joint replacement surgery at a New Zealand general hospital. Most patients underwent hip replacement (90%) with the remainder undergoing knee replacement surgery. Demographic data are not available for eight of the participants who failed to complete that section of the questionnaire. The mean age of the group was 66 years ($SD = 8.7$ years). Only one quarter (25%) were employed, with most (63%) describing themselves as retired. About one third (29%) lived alone.

MEASURES

Personality

Optimism was assessed with the Life Orientation Test (LOT; Scheier and Carver, 1985), which consists of eight items answered on a 5-point response scale ranging from "strongly agree" to "strongly disagree." LOT has been shown to have a unidimensional factor structure, good internal consistency and retest reliability, convergent and discriminant validity, and be free from response bias (Scheier and Carver, 1987). Coherence was measured with the Sense of Coherence Scale (SOC; Antonovsky, 1983). This scale consists of 29 items with a 5-point multiple choice response format. A summary of 11 studies using the scale demonstrate it to have high internal consistency, with Cronbach alphas ranging from 0.84 to 0.93, and to support the validity of the scale in the health context (Antonovsky, 1987).

Recovery Measures

Pain was measured on a visual analogue rating scale with anchors "no pain" to "worst possible pain." Self-rated health was assessed with the question "Compared to the

person in excellent health, how would you rate your health at the present time?" answered on a 7-point category scale from "terrible" to "excellent." Measures of this type have been shown to relate to physician ratings of health (LaRue, Bank, Jarvik and Hetland, 1979), and to be predictive of mortality (Idler and Kasl, 1991). Life satisfaction was measured with the question "How do you feel about your life as a whole?" rated on a 7-point "delighted" to "terrible" scale. Andrews and Withey (1976) report this single item measure to have high estimated reliability and validity, and to correlate substantially with other measures of satisfaction and well-being. The Mental Health Inventory (MHI; Viet and Ware, 1983) was used to assess positive well-being and psychological distress. These two broad sub-scales of the MHI have been found to assess the positive and negative dimensions of psychological well-being (Chamberlain and Zika, 1992) and they relate closely to the surgical recovery dimensions identified by Johnston (1984). The MHI contains 38 items rated on a 5 or 6-point response scale. It has high internal consistency, moderate retest stability over a one year interval (Viet and Ware, 1983), and good discriminant validity (Cassileth *et al.*, 1984). As well as these major measures, both patients and surgeons provided ratings on a number of other recovery measures concerned with more medical aspects of the surgery (see below).

Procedure

Subjects were contacted for participation in the study on admission to hospital when the study procedures were explained in detail. Subjects completed the first questionnaire one or two days prior to surgery ($M = 1.64$ days, $SD = 2.16$ days). They were scheduled to complete a second brief questionnaire on the third day after surgery, and a final questionnaire at their post-surgery check approximately six weeks after surgery. Because questionnaires were administered at times convenient to hospital staff, variations in the timing of post-operative questionnaire administration inevitably occurred for some patients ($M = 3.80$ days, $SD = 3.82$ days). The post-surgery check was also subject to variation due to surgeon and patient availability for appointments ($M = 52.30$ days, $SD = 22.20$ days).

The pre-surgery questionnaire contained the MHI, life satisfaction, LOT, and SOC, as well as the measure of self-rated health and the visual analogue pain scale. The post-surgery questionnaire included the visual analogue pain measure and patient ratings of recuperation. The follow-up questionnaire contained the recuperation ratings, together with the MHI, life satisfaction, self-rated health, and visual analogue pain measures.

Operations were performed by two surgeons, who each rated their patients for pain, mobility, infection and complications at both the post-operative and follow-up checks. Surgeons were blind to patient responses. All patients received general anaesthesia.

RESULTS

Pattern of Recovery

The data were first examined for changes in psychological well-being as a result of the surgery. *Table 1* presents mean scores for life satisfaction, positive well-being and psychological distress measures at pre-surgery and follow-up. As can be seen in this

Table 1 Means and standard deviations for recovery measures before surgery and at the six-week follow-up

Measure	N	Pre-surgery		Follow-up		F
		M	SD	M	SD	
Life satisfaction	50	5.58	0.76	5.82	0.75	5.618*
Positive well-being	45	64.64	9.87	70.44	8.33	15.749***
Psychological distress	44	46.59	10.90	39.20	9.51	22.168***
Self-rated health	50	5.14	0.95	5.60	1.01	10.707**

* $p < .05$, ** $p < .01$, *** $p < .001$.

table, patients showed significant improvement in life satisfaction and positive well-being and a significant decrease in psychological distress following surgery.

Pain scores assessed by visual analogue also showed a significant improvement following surgery. Mean scores reduced from 30.00 ($SD = 21.30$) pre-operatively to 11.14 ($SD = 16.04$) after the operation, and reduced further to 5.52 ($SD = 6.95$) at the six week follow-up ($F(2,86) = 34.75$, $p < .001$). Surgeons' ratings of patient pain provided independent confirmation of these results, with pain levels decreasing significantly from the post-operative assessment to follow-up ($F(1,43) = 15.34$, $p < .001$).

Patients' self-rated assessments of recovery were consistent with the improvements in well-being and pain. Self-rated health, shown in *Table 1*, increased significantly. There was continued improvement in several other recovery measures from the post-operative period to follow-up. Patients rated their surgical wound as significantly less tender and sore ($F(1,49) = 16.37$, $p < .001$), and their sleep ($F(1,45) = 35.44$, $p < .001$) and appetite ($F(1,46) = 27.76$, $p < .001$) as significantly improved over that period. Data from the surgeons confirmed the success of the surgical procedures in terms of medical outcomes. Patients remained in bed for a brief period following their operation ($M = 2.66$ days, $SD = 1.02$ days), and only a small minority (5%) were not mobile at the post-operative assessment. Very few (2%) showed any signs of post-operative infection.

These results suggest that the surgical procedures were highly successful, and that patients were better off in terms of their pain levels, self-rated health, and psychological well-being. However, we noted some sex differences in the reports of well-being and pain. A MANOVA was conducted to investigate the possibility of an interaction between sex and recovery on the well-being, distress and pain variables. Recovery was a within-subject factor with two levels, pre-operative and follow-up. There was a significant main effect for recovery ($F(5,31) = 11.01$, $p < .001$), confirming the findings presented in *Table 1*. There was also a main effect for sex ($F(5,31) = 2.64$, $p < .05$), but more importantly, no significant interaction between sex and recovery ($F(5,31) < 1$, n.s.). Although females reported higher levels of pain and distress, and lower levels of well-being than males, the groups did not show differential rates of recovery.

Optimism and Coherence

Our major focus was to examine the relationship of optimism and sense of coherence to the indices of recovery. Correlations for optimism and coherence with the recov-

ery variables, both prior to the operation and at the follow-up, are presented in Table 2. The pattern of associations with optimism and coherence are generally similar, as might be expected from their substantial positive inter-correlation ($r = 0.62$, $p < .001$). Both personality variables are moderately associated with life satisfaction, positive well-being, and psychological distress. Patients who are optimistic, and patients who have higher levels of coherence, report more life satisfaction and positive well-being, and lower levels of distress. However, there are differences between optimism and coherence in their associations with the recovery variables. Overall, coherence exhibits higher correlations than optimism with these measures. They also relate differently to pain and self-rated health. Coherence, but not optimism, is positively associated with self-rated health. Patients with higher coherence have a more positive view of their health. On the other hand, optimism is negatively associated with pain, both pre-operatively and at follow-up, whereas coherence is uncorrelated with pre-operative levels of pain. These differences suggest that optimism and coherence should be viewed as related but different personality constructs.

We also examined the relation of optimism and coherence to the other indices of recovery; sleep, appetite, wound comfort, and mobility. Optimism and coherence were found to have weak and inconsistent relationships with these outcome measures. This was probably the result of these measures exhibiting very little variance as a function of the substantial and rapid improvement for almost all patients in these areas, and the results of these analyses are not reported further.

We next examined the role of optimism and coherence in predicting surgical recovery in the context of pre-surgery levels of psychological state, pain, and self-rated health. Patients standing on these variables prior to surgery may have influenced their recovery. To examine these effects we conducted a series of hierarchical multiple regression analyses predicting each recovery variable assessed at follow-up. Pre-surgery levels of each variable were controlled by entering them on the first step of the regression. Optimism and sense of coherence were entered jointly on the second step. Analyses were conducted with listwise deletion of missing data. Table 3 presents the results of these analyses. Because the follow-up pain scores were skewed, we repeated the analyses for pain using both square root and logarithmic transformations. These analyses gave essentially similar results and are not reported.

Apart from pain, patients' pre-surgery level on each variable used to index recovery was a significant predictor of their score on the variable following surgery. After controlling for pre-surgery levels, the health promoting variables, optimism

Table 2 Correlations for personal optimism and sense of coherence with recovery measures before surgery and at the six-week follow-up

Measure	Optimism		Coherence	
	Pre-op ^a	Follow-up ^b	Pre-op ^a	Follow-up ^b
Life satisfaction	.37**	.42**	.45***	.54***
Positive well-being	.49***	.49***	.66***	.70***
Psychological distress	-.36**	-.38**	-.56***	-.56***
Self-rated health	.23	.18	.25*	.48***
Pain	-.37**	-.33*	-.16	-.32*

^a $N = 50$, ^b $N = 40$.
* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 3 Hierarchical multiple regression analyses for recovery variables predicted by presurgery level of variable, optimism and sense of coherence

Measure	N	R^{2a}	R^2 -change ^b	Beta	
				Optimism	Coherence
Life satisfaction	43	.300***	.047	-.017	.265
Positive well-being	44	.194**	.260***	.127	.570***
Psychological distress	49	.241***	.064	.113	-.322
Self-rated health	48	.240***	.145**	-.038	.411**
Pain	43	.041	.113	-.140	-.245

^a R^2 values are for presurgery level of the measure entered on step 1.

^b R^2 -change values are for optimism and coherence entered jointly on step 2.

** $p < .01$, *** $p < .001$.

and sense of coherence, failed to jointly predict any significant additional variance in the negative recovery variables, distress and pain. However, they jointly predict significant additional variance for the positive recovery variables of psychological well-being and self-rated health, although not for overall life satisfaction. An analysis of the relative contributions of sense of coherence and optimism confirmed the previous correlational results. Significant beta weights were obtained for both psychological well-being (beta = .570, $t(1,39) = 3.576$, $p < .001$) and self-rated health (beta = .411, $t(1,44) = 2.766$, $p < .01$) with sense of coherence, but for neither variable with optimism (psychological well-being, beta = .127, $t(1,39) < 1$; self-rated health, beta = -.038, $t(1,44) < 1$). From this analysis it appears sense of coherence is a more powerful predictor of the positive aspects of recovery than optimism.

DISCUSSION

Results from the present study clearly demonstrate that surgery for elective joint replacement produces beneficial psychological outcomes. Prior to surgery, these patients were in substantial pain and distress. Following the operation, they experienced significant pain reduction, decreased distress, and increased positive well-being. They also reported significant improvements in a range of other factors, such as sleep quality, appetite, and self-rated health. These findings are consistent with previous research (Wiklund and Romanus, 1991) reporting increased functional improvement and quality of life following such surgery, but this study demonstrates that these results occur over a shorter time period. They also provide support for Johnston's (1984) recommendation for positive aspects of recovery to be included in research on surgical outcome.

The major focus of this research was to examine the role of optimism and sense of coherence in predicting recovery following the operation. In the present study, pre-surgery levels of well-being, distress, and self-rated health were the best predictors of post-surgery levels of each of these variables respectively, confirming previous research (Jamieson *et al.*, 1987; Wallace, 1986). After controlling for pre-surgery levels on these outcome measures, the personality variables jointly predicted recovery on the positive outcome measures, but did not predict distress or pain. Although optimism was correlated with all measures of recovery except self-rated health, this effect was not sustained when the other variables were controlled.

Increased variance in the outcome measures explained by the personality factors, over and above that explained by pre-surgery levels of outcome measures, was attributable to coherence rather than to optimism. This suggests sense of coherence to be a more potent variable than optimism in this context.

These results parallel findings by Williams (1990) who compared coherence with hardiness, and found coherence to be the more powerful mediator of stress and illness. While optimism has also been found in previous research to be predictive of surgical outcome (Kiyak, Vitaliano and Crinean, 1988; Scheier *et al.*, 1989) these studies differed from the present research as they did not examine the role of coherence, and used a different range of outcome measures.

The mechanisms linking personality factors to surgical recovery are not clear. It has been proposed that personality factors relate to more effective coping behaviours following the operation (Mathews and Ridgeway, 1981; Scheier and Carver, 1987). Antonovsky (1987) suggests that having a strong sense of coherence makes people more likely to utilize "generalised resistance resources," such as using more adaptive coping styles, better stress management procedures, or more effective social support utilization. Scheier *et al.* (1989) found optimism to be positively associated with problem-focused coping strategies and negatively associated with denial in their study of recovery after coronary artery surgery, giving empirical support to this proposal. Other researchers have argued for an immunologically mediated relationship between personality and surgical outcome and this has received some support (Kamen-Siegel *et al.*, 1991; Linn, Linn and Klimas, 1988). Measures of coping strategies and immune function were not available in the present study, so these proposals could not be investigated directly. Further research on the mechanisms through which personality variables exert their effects is needed.

Most previous research on surgery has concentrated on medically-related outcomes, such as mortality, complications, and length of stay in hospital, and rarely on the reports and feelings of patients. Troidl *et al.* (1987) note the paradox involved for surgery when the research focuses on medical effectiveness while the principal criteria guiding surgeons' decisions are the patients' capacities and feelings. There is a need for more research focusing on the psychological aspects indexing recovery from surgical procedures. When psychological variables have been studied, it has mostly been in the context of chronic life-threatening diseases such as cancer, heart disease, and end stage renal disease (O'Young and McPeck, 1987). In such conditions there are often high levels of pain and disability, and they usually involve more extensive surgical procedures. The present study demonstrates that psychological factors can document improvement in less severe and non-life-threatening conditions. These findings are important because they occurred in a context where there was little variance in medical outcomes. Almost all patients were mobile within a short time and the rate of complications and infections was negligible. It is the psychological outcomes that document the substantial change in state for these patients after surgery.

Results from the present study need to be considered within their context. Although patients were in considerable pain and distress with a chronic condition they were not experiencing a life-threatening illness, and the surgery involved was elective. Also, the follow-up period was relatively brief. However, even over this brief period, there was substantial improvement in the psychological outcomes, and very limited scope for further improvement in medically-related outcomes. Finally, most of the data obtained here were based on patient self-report. However, these

results were confirmed by surgeon reports where these were available, and patient self-report may well be the best data source to index recovery (Troidl *et al.*, 1987).

In summary, the findings reported here strongly support Johnston (1984) in the view that recovery is a multidimensional process, and that more attention should be given to investigating positive as well as negative psychological aspects of recovery. Differences in recovery can be explained by personality factors, and the mechanisms underlying this need to be investigated more explicitly in future research. Although there are several personality constructs that could be included in any such research, our findings suggest that the sense of coherence may be a pervasive disposition with particular promise in this regard.

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