

Patients' Perceptions of Their Pain Condition Across a Multidisciplinary Pain Management Program

Do They Change and if So Does It Matter?

Rona Moss-Morris, PhD,* Katrina Humphrey, MSc,† Malcolm H. Johnson, MA, DipClinPsych,† and Keith J. Petrie, PhD, DipClinPsych†

Objectives: The primary aim of this study was to determine whether changes in cognitive processes are related to improved functional outcomes across a multidisciplinary pain management program.

Methods: A longitudinal design was employed where patients completed 6 versions of the same questionnaire at the beginning, middle, and end of the 4-week treatment program and at 1, 3, and 6 months follow-up. Seventy-six patients consented to participate in this study. Outcome was assessed using the physical and mental component scores of the Short Form Health Questionnaire. Measures of cognitive processes included the Illness Perceptions Questionnaire Revised, the Pain Catastrophizing Scale, and the Pain Vigilance and Awareness Questionnaire. Fifty-eight patients (76%) completed all 6 questionnaires.

Results: We found reductions in catastrophizing and beliefs about the serious consequences of pain were most strongly associated with improved physical functioning, whereas reductions in pain vigilance, emotional representations of pain, and sense of coherence about pain were the best predictors of improved mental functioning. Overall, change in cognitive processes accounted for 26% of the variance in improved physical functioning and 23% of the variance in mental functioning.

Discussion: These findings suggest that interventions that specifically target cognitive processes may enhance treatment effects for patients with chronic pain.

Key Words: multidisciplinary pain program, illness perceptions, catastrophizing, pain vigilance, cognitive processes

(*Clin J Pain* 2007;23:558–564)

Received for publication July 24, 2006; revised April 17, 2007; accepted April 23, 2007.

From the *School of Psychology, University of Southampton, Highfield, Southampton, United Kingdom; and †Department of Psychological Medicine, Faculty of Medical and Health Sciences, The University of Auckland, New Zealand.

Funded by the Keith McGavin Pain Research Fund.

Reprints: Dr Rona Moss-Morris, School of Psychology, University of Southampton, Highfield, Southampton, SO17 1BJ, United Kingdom (e-mail: remm@soton.ac.uk).

Copyright © 2007 by Lippincott Williams & Wilkins

Over the past 20 years a substantial body of evidence has accumulated arguing the efficacy of multidisciplinary pain management programs for chronic pain.^{1–3} However, both the efficacy of individual components of these programs and the mechanisms of change across the programs remain unclear.^{4,5} Gaining an understanding of the key mechanisms of a treatment effect is important for 2 reasons. First, it can help to refine the treatment approach. Most multidisciplinary programs include a variety of treatment techniques and approaches, some of which may be more efficacious than others. Second, it can contribute to our understanding of the condition itself. For example, a number of theoretical models of chronic pain incorporate patients' beliefs or cognitions as key components in the maintenance of pain and disability.^{5,6} These cognitive processes are seen to have both a direct impact on the experience of pain severity and indirect effects through driving behaviors such as avoidance, which lead to pain-related disability.^{7–10} Most multidisciplinary pain management programs incorporate cognitive techniques based on these models.^{4,11} If altering patients' beliefs predicts improvement in pain outcomes this provides further support for the role of beliefs in contributing to the chronicity of pain conditions.

A handful of studies have already shown that altering patients' cognitions may be an important component of multidisciplinary pain programs. Most have focused on catastrophic thinking or having unduly negative thoughts about pain, its meaning, and its effects on one's life.^{7,8} Reductions in pain catastrophizing have consistently been associated with improvements in pain severity, pain interference, and depression.^{12–16}

The purpose of the current study was to extend this work by investigating possible treatment effects on a wider range of cognitive variables that have been shown to be associated with pain-related disability. In the literature on cognitive models of illness, catastrophizing is conceptualized as an information processing error that results from a negative schema or cognitive representation together with a tendency to be overly focused on this dominant schema.¹⁷ Cognitive change in one system can theoretically alter another system.

If we translate this to the pain literature, a negative representation of one's pain condition would result in an

increased vigilance to pain and a tendency to interpret pain in a catastrophic manner.¹⁸ In line with this suggestion, a number of studies have demonstrated a relationship between catastrophizing and the tendency to be hypervigilant to pain sensations.^{19–22} Recent evidence also suggests that hypervigilance to pain may contribute to chronicity of pain and higher levels of disability.²³ Similarly, patients who have more negative or pessimistic representations of their pain are more disabled and distressed.²⁴ Consequently, the current study aimed to investigate: (1) whether patients' negative representations of their pain, hypervigilance to and catastrophizing about pain changed across a multidisciplinary pain program in accordance with changes in disability, (2) whether these changes were maintained 6 months after the program, and (3) whether changes in cognitions were related to improved outcomes.

MATERIALS AND METHODS

Participants

Participants were recruited from The Auckland Regional Pain Service's 4-week group pain management program. Patients attend the programme 5 days a week from 8.15 AM to 3.00 PM. The program accepts referrals from other hospital services, general practices, and insurance and compensation agencies across a wide geographical area. Referrals occur because the patient is either distressed or disabled to a greater extent than the referrer expects from the medical history. Most patients have had pain for a considerable period of time and have received a wide range of interventions ranging from physical therapy, medications, medical interventions, and surgery. Referrals are then assessed and offered positions in the programme if they have a chronic pain condition, regardless of site of the pain, and might benefit from a multidisciplinary pain management program with a reactivation focus. Patients are not accepted onto the program if they are still receiving interventional treatments, are involved in ongoing litigation related to their condition, have alcohol or illicit drug problems, or have a psychiatric condition, such as a psychotic disorder or social phobia, that will prevent them functioning in a group program.

The emphasis of the program is on reactivation. Program components include, graded goal directed exercise, relaxation, pain education, goal setting as well as information and therapeutic suggestions on specific issues such as sleep and mood management. Specific sessions in the psychoeducation component of the program address "ways of thinking," "stress," and "fear and avoidance" using cognitive restructuring techniques that focus on anxious or catastrophic thinking that inhibits reactivation.

A total of 98 patients with chronic pain attended the program during the recruitment period and 76 provided informed consent to participate in the study (a response rate of 78%). Sixty-four of these patients completed questionnaires at the end of treatment (84%) and 58 at

6 months follow-up (a follow-up rate of 76%). Forty-nine participants (65%) were female and the mean age of the sample was 42.4 (SD 9.49). Patients had experienced their pain problem for a mean length of 7.05 (SD 6.88) years and 57% were unemployed because of their pain. The majority of the participants (82%) described themselves as European or white New Zealanders, 8% as Maori, and the remainder were of Pacific Island or Asian descent. Fifty-eight percent of the samples were married or in a de facto relationship, 16% were single, and 26% were widowed, divorced, or separated. With regard to level of education, half of the sample was educated to primary or secondary school level, 24% had a technical or trade certificate, and the remainder had some form of university or tertiary education.

Measures

*The Short Form Health Questionnaire (SF-36)*²⁵ was used to measure clinical outcome across the 28 weeks of the study. The SF-36 was developed for medical outcomes research over several years and has excellent reliability and stability. Normative data are available for chronic pain populations.²⁶ There are 8 subscales which can be computed to form a Mental Component Summary Score and a Physical Component Summary Score.²⁷ The Mental Component measures the extent to which patients' emotional state interferes with their ability to perform daily tasks and to socialize. It also measures their levels of psychologic well being. The Physical Component summary score measures patients' abilities to perform simple everyday tasks such as climbing stairs, dressing, and lift objects, as well how much their pain and health in general interferes with their ability to work or perform other life roles. It also measures the extent of bodily pain experienced. Higher scores on the SF-36 represent less disability.

*The Revised Illness Perceptions Questionnaire (IPQ-R)*²⁸ was used to measure patients' schematic representation of their pain condition. The IPQ-R has good construct and criterion validity and discriminates clearly between acute and chronic pain populations.²⁸ The dimensions of the IPQ-R have also been associated with pain, distress, and disability in chronic pain patients.²⁴ Five of the subscales most relevant to cognitive change across a pain management program were included in the current study. Three of these measured patients' negative representations of their pain: the consequences subscale measured patients' perceptions that their pain has had serious consequences on their lives; the timeline dimension measured beliefs that the condition is chronic rather than acute; whereas the emotional representations scale measured patients' emotional distress in relation to their pain condition. The remaining 2 subscales are scored in the positive direction. The control dimension includes 2 subscales, one which measures beliefs about personal control over the pain, and the other, beliefs that treatment will help to control the pain. Pain coherence measures the degree to which patients feel they have a coherent understanding of their condition.

The Pain Catastrophizing Scale²⁹ was used to assess patients' tendencies to catastrophize about their pain. It consists of 13 items which represent a range of catastrophic thoughts and feelings in response to the experience of pain. Patients are asked to rate the degree to which they have these thoughts and feelings when in pain. High scores represent greater catastrophizing. The scale can be divided into 3 subscales: rumination, magnification, and helplessness. However, these subscales are moderately to highly correlated and the total score has high internal consistency (coefficient $\alpha = 0.87$).²⁹ The total score was used in the current study. The Pain Catastrophizing Scale has good construct and criterion validity²⁹ and has been associated with levels of disability in patients with soft tissue injuries even when controlling for levels of depression and pain intensity.³⁰

Hypervigilance to pain was assessed using the Pain Vigilance and Awareness Questionnaire.³¹ This questionnaire consists of 16 items which measure on a 6-point behavioral scale the extent to which people focus on or attend to their pain. Like the Pain Catastrophizing Scale it can be divided into smaller subscales or used as a total scale.³² The total scale has good internal reliability and construct validity.³² High scores on the Pain Vigilance and Awareness Questionnaire have been associated with pain intensity, psychological distress, psychosocial disability, and physician visits.³¹

Procedure

Ethical approval for this study was granted by the Ministry of Health Ethics Committee. Patients were invited to participate in the study on the first day of their pain management program. The study involved completing the same questionnaire 6 times over a 28-week period. Patients were informed that this information would be confidential to the research and that their personal information would not be shared with the staff involved in their treatment. Patients who provided informed consent completed the baseline questionnaire on this day. They also completed the same questionnaire 2 weeks into the program, and on the last day of the 4-week program. Patients were then sent follow-up questionnaires at 1 month, 3 months, and 6 months posttreatment. If the questionnaires were not returned,

patients were sent up to 3 reminder letters and were also telephoned.

Data Analysis

All data analyses were conducted on SPSS for Windows version 12. Pearson correlations were used to explore interrelationships between the baseline variables. A series of 1-way within-participant analysis of variance (ANOVA) was used to answer the first research question, which looked at change over time in relation to patients' treatment outcome and cognitions. If the ANOVA was significant, polynomial contrasts and post-hoc paired-samples *t* tests using Bonferroni correction for multiple comparisons were used to investigate the nature of the change and the site of the differences. Mean scores across all the variables were computed into percentage scores (ie, scores out of 100) for comparability across the Figures, but the original scale scores were used in the analyses. Hierarchical regression was used to investigate the relationships between change in the cognitive variables and change in outcome.

RESULTS

Interrelationships Between the Baseline Variables

The intercorrelations between the cognitive variables and the 2 composite SF-36 scores are presented in Table 1. There were small to moderate correlations between most of the cognitive variables except for illness coherence, which was only associated in a negative direction with emotional representations. Control over pain also showed fewer associations than the others, being negatively correlated with catastrophizing, chronic timeline beliefs, and emotional representations. The strongest associations were between pain catastrophizing and pain vigilance ($r = 0.50$) and pain catastrophizing and emotional representations ($r = 0.49$). In most other instances, the significant correlations ranged from 0.20 to 0.40.

Almost all of the cognitive variables were significantly associated with the mental and physical component scores. The exceptions were pain vigilance and the physical component score and timeline and the mental component score, although both these correlations were in the expected direction. The strongest associations were

TABLE 1. Intercorrelations Between the Cognitive Variables and SF-36 Component Scores at Baseline

	1	2	3	4	5	6	7	8	9
1. Pain Catastrophizing Scale		0.50***	0.31*	0.27*	0.49**	-0.18	-0.41**	-0.37***	-0.51***
2. Pain Vigilance and Awareness Questionnaire			0.15	0.29*	0.28*	0.03	-0.10	-0.19	-0.33**
3. IPQ-R consequences				0.35**	0.43***	0.01	0.03	-0.47***	-0.41***
4. IPQ-R timeline					0.26*	0.05	-0.28*	-0.32**	-0.21
5. IPQ-R emotional representation						-0.40***	-0.19	-0.46***	-0.64***
6. IPQ-R coherence							0.24*	0.25*	0.31**
7. IPQ-R control								0.36**	0.30**
8. SF-36 Physical component									0.64***
9. SF-36 Mental component									

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

between emotional representations and the mental component score ($r = 0.64$) and pain catastrophizing and the mental component score ($r = 0.51$).

Change in Outcome Data Over Time

Two separate 1-way within-participant ANOVAs with time as the factor and the 2 SF-36 summary scores as the dependent variables were used to determine whether patients' pain-related disability levels improved over the 28 weeks of the study. The means for the 2 SF-36 component summary scores across time are presented in Figure 1. The results for the ANOVA for the Physical Component Summary of the SF-36 indicated a significant time effect, Greenhouse-Geisser = 0.77, $F(3,86) = 8.37$, $P < 0.001$. Follow-up polynomial contrasts indicated a significant quadratic effect $F(1,52) = 20.84$, $P < 0.001$. Figure 1 demonstrates that most of the gains in physical functioning were made at the end of treatment and that there was some drop off in improvement by 28 weeks follow-up. However, post-hoc t tests, showed that the baseline scores were significantly lower than those of all the 5 follow-up points ($P < 0.001$), suggesting that some of the treatment gains were in fact maintained. A similar pattern was evident for the Mental Component Summary score. The ANOVA showed a significant time effect, with Greenhouse-Geisser = 0.77, $F(4,37) = 3.17$, $P < 0.01$. Follow-up polynomial contrasts indicated a significant quadratic effect $F(1,52) = 20.84$, $P < 0.001$, but post-hoc t tests indicated that baseline scores were significantly lower than scores at all 5 follow-ups ($P < 0.001$).

Change in the Cognitive Variables Across Time

The percentage means over time for the 3 negative illness representations subscales are presented in Figure 2.

The 1-way within-participant ANOVA for the timeline variable showed that there was no significant time effect, Greenhouse-Geisser = 0.70, $F(3,48) = 1.44$, $P = 0.23$.

There was, however, a significant time effect for both the consequences subscale, Greenhouse-Geisser = 0.80, $F(4,01) = 8.04$, $P < 0.001$ and the emotional representations subscale, Greenhouse-Geisser = 0.83, $F(4,15) = 7.31$, $P < 0.001$. Follow-up polynomial contrasts indicated a significant linear effect for both variables, with patients' beliefs about the consequences of their pain, $F(1,50) = 15.22$, $P < 0.001$ and their emotional responses to their pain, $F(1,50) = 19.49$, $P < 0.001$ both decreasing over time. Examination of the means suggests that most of the gains occurred during the 4 weeks of the program, but that these gains were maintained at follow-up.

The percentage means over time for the 2 positive illness representation scales are presented in Figure 3. There was a significant time effect for both the pain control, Greenhouse-Geisser = 0.71, $F(3,57) = 3.09$, $P < 0.05$ and the pain coherence subscales, Greenhouse-Geisser = 0.76, $F(3,80) = 16.55$, $P < 0.001$. Follow-up polynomial contrasts indicated a significant linear effect for both variables, $F(1,50) = 4.82$, $P < 0.05$ for the control subscale and $F(1,48) = 37.46$, $P < 0.001$ for the coherence subscale. However, examination of the means shows an important difference between the variables. Patients' coherence or understanding of their pain continued to improve over time, whereas their sense of control remained largely unchanged across the 4 weeks of the pain management program, and then decreased slightly over the follow-up time points.

The percentage means over time for the Pain Vigilance and Awareness Questionnaire and Pain Catastrophizing Scale are presented in Figure 4. The 1-way within-participant ANOVA for the Pain Vigilance and

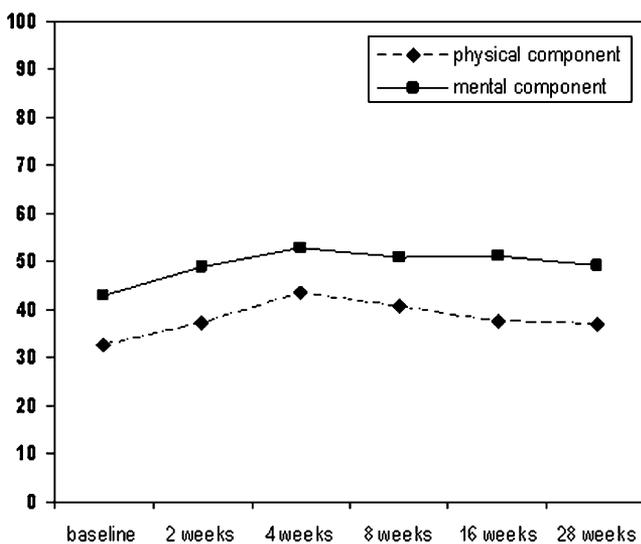


FIGURE 1. The SF-36 component summary scores across the pain management program (baseline to 4 wk) and during follow-up (8 to 28 wk).

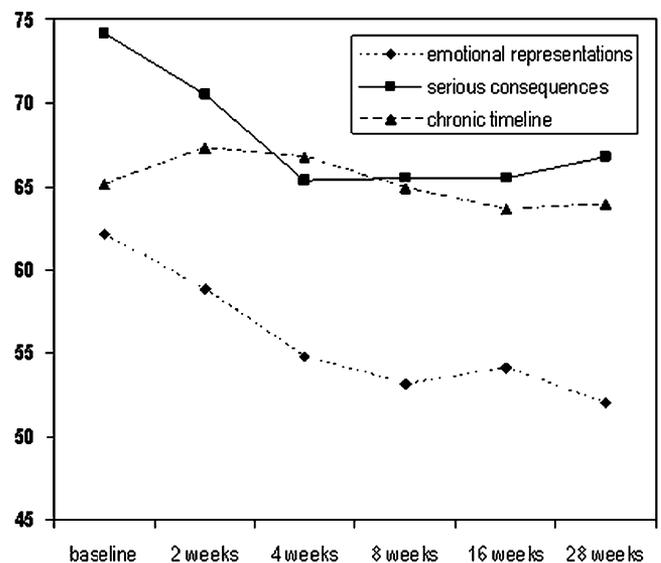


FIGURE 2. The Illness Perception Questionnaire-Revised (IPQ-R) negative dimensions across the pain management program (baseline to 4 wk) and during follow-up (8 to 28 wk).

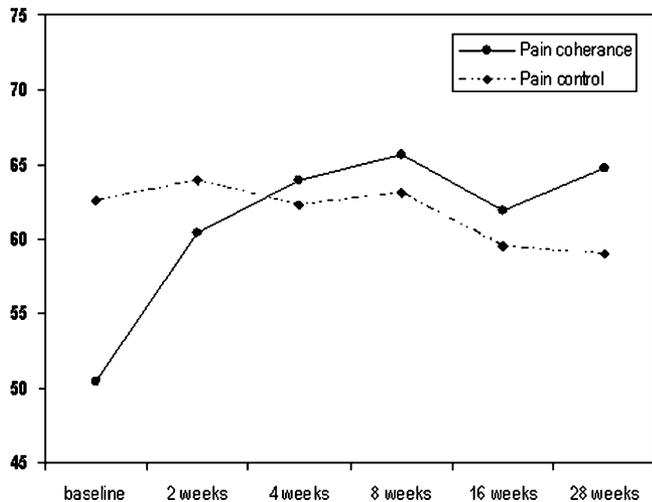


FIGURE 3. The Illness Perception Questionnaire-Revised (IPQ-R) positive dimensions across the pain management program (baseline to 4 wk) and during follow-up (8 to 28 wk).

Awareness Questionnaire indicated that there was no significant time effect for hypervigilance to pain, Greenhouse-Geisser = 0.82, $F(4,12) = 0.86$, $P = 0.50$. There was, however, a significant effect for the Pain Catastrophizing Scale, Greenhouse-Geisser = 0.89, $F(4,45) = 3.18$, $P < 0.01$. Follow-up polynomial contrasts indicated this was a significant linear effect with patients' pain catastrophizing steadily decreasing over time, $F(1,45) = 7.00$, $P < 0.05$.

The Relationship Between Change in Cognitions and Change in Outcome

Hierarchical multiple regression analyses were used to assess whether change in pain cognitions predicted improvement in outcome. For these analyses, change

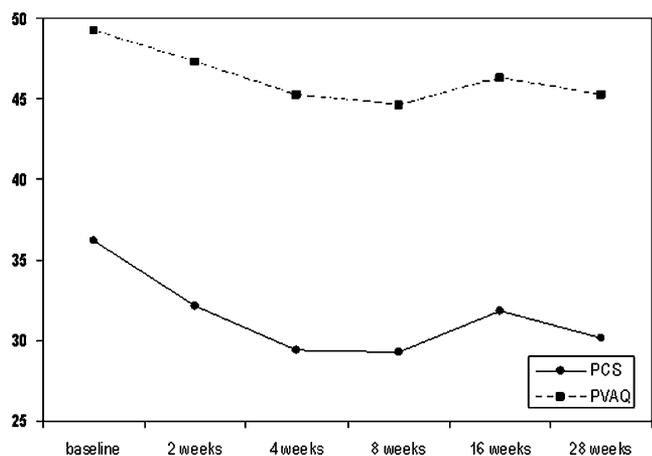


FIGURE 4. The Pain Catastrophizing Scale and Pain Vigilance and Awareness Questionnaire scores across the pain management program (baseline to 4 wk) and during follow-up (8 to 28 wk).

variables were created for the 7 cognitive variables by subtracting patients' baseline scores from their scores collected at the end of the program (ie, at 4 wk). These 7 variables represented the amount of cognitive change that occurred across the pain management program. Two separate regression analyses were conducted for each of the SF-36 summary scores collected at end of the pain management program, with the baseline SF-36 summary score entered on the first step and the 7 cognitive change variables on the second step. The results of these analyses are presented in Table 2.

For the Physical Component Summary, baseline levels accounted for 30% of the variance. The cognitive change scores added a further significant 26% of the variance, $F(7,46) = 7.19$, $P < 0.001$. Examination of the β weights suggested that decreases in catastrophizing about pain and in beliefs about the serious consequences of the pain were the most significant predictors of improved outcome. For the Mental Component Summary, baseline levels accounted for 37% of the variance and the cognitive change scores an additional significant 23% of the variance $F(7,46) = 3.62$, $P < 0.01$. Decreases in hypervigilance to pain and emotional responses to pain, and an increase in understanding of pain were all significant predictors of improved mental functioning.

DISCUSSION

The results show that a multidisciplinary pain program is successful in improving pain-related disability. Patients reported gains in both their mental and physical well being, with maximum treatment gains reported at the end of the 4-week pain management program. Over the 6-month follow-up period there was a small loss in treatment gains, but patients were still functioning significantly better at follow-up than before the program.

TABLE 2. Results From the Linear Regression Analyses Where the SF-36 Subscale Scores at the End of the Pain Management Program Were Regressed on Baseline SF-36 Subscale Levels and the Cognitive Change Scores

	Mental Component β	Physical Component β
Step 1: Baseline variable	0.58*** $R^2 = 0.37***$	0.55*** $R^2 = 0.30***$
Step 2: Change Variables		
Pain Catastrophizing Scale	-0.12	-0.27*
Pain Vigilance and Awareness Questionnaire	-0.28*	-0.07
IPQ-R consequences	-0.12	-0.29**
IPQ-R timeline	0.07	-0.01
IPQ-R emotional rep.	-0.30*	-0.07
IPQ-R coherence	-0.24*	0.07
IPQ-R control	0.11	-0.05
	R^2 change = 0.23**	R^2 change = 0.26**

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

Control variables = outcome at baseline.

These findings are in line with previous evaluations of this particular program.³³

The pain management program also had a positive effect on patients' pain cognitions. At the end of the treatment patients showed significant decreases in their tendency to catastrophize about their pain and these changes were maintained at 6 months follow-up. In turn, decreases in catastrophizing were associated with improvements in the physical component of the SF-36. This component is a composite score of pain severity as well as how much pain and health status interferences with the physical aspects of day-to-day life. Changes in catastrophizing across multidisciplinary pain programs have been documented in a number of other studies,¹²⁻¹⁶ but only one has shown that these changes are in fact maintained over time.¹⁶ All of these studies have shown that a decrease in catastrophizing is an important correlate or mediator of improvements. The consistency of these findings suggests that cognitive interventions aimed at decreasing unhelpful interpretations about pain are an important component of multidisciplinary treatments.

As far as we are aware, this was the first study to assess pain representations using the IPQ-R across a chronic pain management program. We found patients reported a number of positive changes to their pain beliefs. At the end of treatment there were significant reductions in patients' beliefs about the serious consequences of their pain, and their emotional representations of their pain. They also reported an increased sense of coherence or understanding of their pain condition and once again these changes were maintained at follow-up.

In line with our findings for catastrophizing, changes in these illness representation dimensions were associated with improvements across the pain management program. Reductions in the perceptions of the serious consequences of pain were associated with improvement in the physical component of the SF-36, whereas reductions in emotional representations of pain were associated with increases in the mental component of the SF-36. Thus, if patients are less distressed by their pain their pain is less likely to interfere with their ability to socialize and their general sense of well being. Interestingly, an increased understanding of pain was associated with a decrease in the mental component of the SF-36. This may be because multidisciplinary pain programs emphasize the biopsychosocial nature of pain, and increasing patients' understanding of the psychosocial aspects of pain may result in them attributing some of their pain-related disability to mental rather than physical factors. This may have benefits in that it could lead to a reduction in the physical aspects of disability. However, this aspect warrants further attention, because if helping patients to gain a more coherent view of their pain is increasing their distress or social disability, this needs to be dealt with during the treatment program. Eliciting patients' feelings and beliefs in the regard may be an important way forward.

There were also cognitive dimensions that seem to be unaffected by the pain program, including chronic

timeline and control beliefs. Indeed, by 6 months follow-up, contrary to our hypothesis, there was actually a significant decrease in patients' beliefs about control over pain.

The recent evidence that acceptance is an important mediator of outcome in chronic pain treatment³⁴ might in part explain why timeline is not altered and lack of change in this variable is not predictive of treatment failure. Part of the process of acceptance is the realization that pain is not necessarily going to remit. Thus, patients may maintain their belief that their condition has a chronic timeline, but are less distressed by this prospect as suggested by their decreases in emotional representations.

More difficult to explain are the control belief findings in this study. Previous studies have shown that pain patients' appraisals of control increase across multidisciplinary programs and that increases are associated with reductions in disability, pain severity, and depression.¹⁴⁻¹⁶ The disparate findings in the current study may reflect differences in measurement as previous studies have measured control beliefs using instruments such as the Pain Coping and Cognition checklist¹⁴ and the Coping Strategies Questionnaire.¹⁵ These measures focus on control as a coping strategy rather than a belief about pain and, therefore, that may be more sensitive to change. Alternatively, it may be that the Auckland Pain Management Program is less successful in altering control beliefs than other programs.

There was also no significant change in pain vigilance at the end of the multidisciplinary program. Although the change was not significant, some patients did show a degree of change on this variable and change in pain vigilance, predicted improvements in the mental component of the SF-36. This may be because less rumination about pain may free up attentional capacity so that pain intrudes less on the mental aspects of functioning.³³

Limitations of this study need to be taken into account. The sample size was relatively small, and we lost 24% of the consenting sample at 6 months follow-up. However, there was a good response rate and data were collected over 1 year of the program. Interestingly, a telephone follow-up of patients that failed to attend the long-term follow-up of this pain treatment program indicated that outcomes for nonattendees were at least as good as attendees.³⁴ Another limitation is that we cannot assess cause and effect in this study. It is possible that changes in cognition occurred because of reductions in disability, rather than the other way around. There were also significant correlations between some of the cognitive variables and it is possible that this created colinearity in the regression equations, masking certain significant effects. The study also relied exclusively on self-report measures. Future studies in this area would benefit from including independent ratings of physical functioning and measures of medical or physiologic indicators of pain.

Taking these limitations into account, this study adds to the small body of literature suggesting that the

cognitive components of multidisciplinary pain programs are important mechanisms of change. In this study, change in cognitive processes accounted for a unique 26% of the variance in improved physical functioning and 23% of the variance in mental functioning. Reductions in catastrophizing and beliefs about the serious consequences of pain were most strongly associated with improved physical functioning and pain severity, whereas reductions in pain vigilance and emotional representations of pain, and an increased sense of coherence about pain were the best predictors of improved mental functioning. From a clinical point of view these findings suggest that interventions that specifically target these beliefs may enhance the treatment effect. Particular focus may be needed on interventions that help reduce vigilance to pain. Although related to outcome in this study, the Auckland program did not seem to significantly reduce hypervigilance. Another variable that warrants further attention both in terms of research and clinical applications is the concept of illness coherence. The increased understanding that patients feel they have about their pain might need to be explored in relation to how this knowledge affects their mental well being. Finally, there seemed to be a small drop off in treatment gains 6 months posttreatment that suggests that follow-up booster sessions may help patients maintain their improvements or possibly continue to improve over time.

REFERENCES

- Flor H, Fydrich T, Turk DC. Efficacy of multidisciplinary pain treatment centres: a meta-analytic review. *Pain*. 1992;49:221–230.
- Patrick LE, Altmaier EM, Found EM. Long-term outcomes of multidisciplinary treatment of chronic low back pain. *Spine*. 2004;29:850–855.
- Turk DC, Okifuji A. Efficacy of multidisciplinary pain centres: an antidote to anecdotes. *Balliere's Clin Anaesthesiol*. 1998;12:103–119.
- Morley S. Process and change in cognitive behaviour therapy for chronic pain. *Pain*. 2004;109:205–206.
- Vlaeyen JW, Morley S. Cognitive-behavioral treatments for chronic pain: what works for whom? *Clin J Pain*. 2005;21:1–8.
- Turk DC. Cognitive-behavioral approach to the treatment of chronic pain patients. *Regional Anesth Pain Med*. 2003;28:573–578.
- Peters ML, Vlaeyen JWS, Weber WEJ. The joint contribution of physical pathology, pain-related fear and catastrophizing to chronic back pain disability. *Pain*. 2005;113:45–50.
- Sullivan MJL, Lynch ME, Clark AJ. Dimensions of catastrophic thinking associated with pain experience and disability in patients with neuropathic pain conditions. *Pain*. 2005;113:310–315.
- Michael ES, Burns JW. Catastrophizing and pain sensitivity among chronic pain patients: moderating effects of sensory and affect focus. *Ann Behav Med*. 2004;27:185–194.
- Tennen H, Affleck G, Zandra A. Depression history and coping with pain: a daily process analysis. *Health Psychol*. 2006;25:370–379.
- Butler AC, Chapman JE, Forman EM, et al. The empirical status of cognitive-behavioral therapy: a review of meta-analyses. *Clin Psychol Rev*. 2006;26:17–31.
- Burns JW, Glenn B, Bruel S, et al. Cognitive factors influence outcome following multidisciplinary chronic pain treatment: a replication and extension of a cross-lagged panel analysis. *Behav Res Ther*. 2003;41:1163–1182.
- Burns JW, Kubilus A, Bruel S, et al. Do changes in cognitive factors influence outcome following multidisciplinary treatment for chronic pain? A cross-lagged panel analysis. *J Consult Clin Psychol*. 2003;71:81–91.
- Spinhoven P, ter Kuile M, Kole-Snijders AMJ, et al. Catastrophizing and internal pain control as mediators of outcome in the multidisciplinary treatment of chronic low back pain. *Eur J Pain*. 2004;8:211–219.
- Woby SR, Watson PJ, Roach NK, et al. Are changes in fear-avoidance beliefs, catastrophizing, and appraisals of control, predictive of changes in chronic low back pain and disability? *Eur J Pain*. 2004;8:201–210.
- Jensen MP, Turner JA, Romano JM. Changes in beliefs, catastrophizing, and coping are associated with improvement in multidisciplinary pain treatments. *J Consult Clin Psychol*. 2001;69:622–655.
- Ingram RE. Self-focused attention in clinical disorders: review and a conceptual model. *Psychol Bull*. 1990;107:156–176.
- Sullivan MJ, Martel MD, Tripp D, et al. The relation between catastrophizing and the communication of the pain experience. *Pain*. 2006;122:282–288.
- Crombez G, Eccleston C, Van den Broeck A, et al. Hypervigilance to pain in fibromyalgia: the mediating role of pain intensity and catastrophic thinking about pain. *Clin J Pain*. 2004;20:98–102.
- Goubert L, Crombez G, Eccleston C, et al. Distraction from chronic pain during a pain-inducing activity is associated with greater post-activity pain. *Pain*. 2004;110:220–227.
- Van Damme S, Crombez G, Eccleston C. Disengagement from pain: the role of catastrophic thinking about pain. *Pain*. 2004;107:70–76.
- Vlaeyen JWS, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain*. 2000;85:317–332.
- Crombez G, Van Damme S, Eccleston C. Hypervigilance to pain: an experimental and clinical analysis. *Pain*. 2005;116:4–7.
- Hobro N, Weinman J, Hankins M. Using the self-regulatory model to cluster chronic pain patients: the first step towards identifying relevant treatments? *Pain*. 2004;108:276–283.
- Ware JE, Sherbourne CD. The MOS 36-item short-form health survey. *Med Care*. 1992;30:473–483.
- Ware JE, Snow KK, Kosinski MA, et al. *SF-36 Health Survey: Manual and Interpretation guide*. Boston: The Health Institute; 1993.
- Ware JE, Kosinski M, Bayliss MS, et al. Comparison of methods for the scoring and statistical analysis of SF-36 health profile and summary measures: summary of results from medical outcomes study. *Med Care*. 1995;33:264–279.
- Moss-Morris R, Weinman J, Petrie KJ, et al. The Revised Illness Perception Questionnaire (IPQ-R). *Psychol Health*. 2002;17:1–6.
- Sullivan MJL, Bishop SR, Pivik J. The Pain Catastrophizing Scale: development and validation. *Psychol Assess*. 1995;4:524–532.
- Sullivan MJL, Stanish W, Waite H, et al. Catastrophizing, pain and disability in patients with soft tissue injuries. *Pain*. 1997;77:253–260.
- McCracken LM. 'Attention' to pain in persons with chronic pain: a behavioral approach. *Behav Ther*. 1997;28:271–284.
- Roelofs J, Peters ML, McCracken L, et al. Pain Vigilance and Awareness Questionnaire (PVAQ): further psychometric evaluation in fibromyalgia and other chronic pain syndromes. *Pain*. 2003;101:229–306.
- Peters J, Large RG, Elkind G. Follow-up results from a randomised controlled trial evaluating in- and outpatient pain management programs. *Pain*. 1992;50:41–50.
- McCracken LM, Carson JW, Eccleston C, et al. Acceptance and change in the context of chronic pain. *Pain*. 2004;109:4–7.