Catastrophizing, functional disability and pain reports in adults with chronic low back pain

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OBJECTIVE: To test the hypothesis that subjective reports of pain severity, pain intensity and functional disability correlate positively with catastrophizing.

PATIENTS: Adults with chronic low back pain for six months or longer presenting to a tertiary care Pain Management Unit.

METHODS: Catastrophizing was measured with the Pain Catastrophizing Scale (PCS) in 40 subjects (23 males, 17 females). Functional disability was measured with the Pain Disability Index and pain severity/intensity was quantified with the McGill Pain Questionnaire. Statistical analysis included Student's *t* test and Pearson correlation analysis.

RESULTS: Student's *t* tests on all dependent variables showed no significant sex differences. Correlational analysis revealed a significant relationship between catastrophizing and pain severity ($r=0.35$, $P<0.05$), between catastrophizing and pain intensity ($r=0.39$, $P<0.05$), and between catastrophizing and disability ($r=0.55$, $P<0.001$). Further analysis revealed the helplessness component of the PCS correlated most strongly with functional disability. Analysis of the relationship between pain intensity and disability revealed no significant relationship.

CONCLUSIONS: These observations support the finding that disability in chronic pain results from various causes, and is not solely a function of pain or pathology. The helplessness component of catastrophizing is most strongly related to disability. The implication of this finding is that psychological variables need proper assessment when there is significant disability. The PCS appears to be a useful tool to delineate further psychological components of chronic pain.

Key Words: *Catastrophizing; Chronic pain; Functional disability; Measurement*

Catastrophisme, invalidité et douleur chez les adultes souffrant de lombalgie chronique

OBJECTIF : Vérifier l'hypothèse selon laquelle les rapports subjectifs d'intensité de la douleur, de gravité de la douleur et d'invalidité sont en corrélation positive avec le catastrophisme.

SUJETS : Des adultes atteints de lombalgie chronique depuis six mois ou plus se présentant dans une unité de contrôle de la douleur d'un centre de soins tertiaires.

MÉTHODES : Le catastrophisme a été mesuré à l'aide de la *Pain Catastrophizing Scale* (PCS) chez 40 sujets (23 hommes et 17 femmes), l'invalidité a été mesurée à l'aide de la *Pain Disability Index* (PDI) et la gravité/intensité de la douleur a été mesurée à l'aide du questionnaire McGill de mesure de l'intensité de la douleur. L'analyse statistique comprenait un test *t* de Student et l'analyse de corrélation de Pearson.

RÉSULTATS : Les tests *t* de Student, appliqué à toutes les variables indépendantes, n'ont révélé aucune différence significative liée au sexe. L'analyse corrélationnelle a révélé un lien significatif entre le catastrophisme et la gravité de la douleur ($r = 0,35$, $p < 0,05$), entre le catastrophisme et l'intensité de la douleur ($r = 0,39$, $p < 0,05$) et entre le catastrophisme et la dysfonction ($r = 0,55$, $p < 0,001$). L'analyse en profondeur a révélé qu'une composante d'impuissance, révélée par la PCS était en corrélation plus forte avec l'invalidité. L'analyse du lien entre intensité de la douleur et invalidité n'a mis en évidence aucun lien significatif.

CONCLUSIONS : Ces observations appuient le fait que l'invalidité associée à la douleur chronique résulte de diverses causes et n'est pas uniquement fonction de la douleur ou de la pathologie. Le sentiment d'impuissance lié au catastrophisme est en forte corrélation avec l'invalidité. Cette observation implique que les variables psychologiques doivent être adéquatement évaluées en présence d'une invalidité significative. La PCS semble utile pour préciser les composantes psychologiques de la douleur chronique.

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Chronic low back pain leads to significant dysfunction in many patients, and is frequently difficult to treat because, in the majority of cases, an underlying pathology cannot be identified (1). When a condition cannot be specifically diagnosed, the traditional pathology model of disease, which infers a direct relationship among pain, pathology and functional disability, cannot serve as a treatment model, and traditional methods of treatment fail (1-3). Management can become even more challenging with the development of clinical depression. Banks and Kern (4) have estimated that clinically significant depression occurs in 30% to 54% of clinic-based chronic pain patients. The complex nature of chronic low back pain and the difficulties encountered with its management have prompted researchers and clinicians to re-examine chronic pain and the issues surrounding this condition.

The result of this interest in chronic pain is the emergence of biobehavioral factors as important indicators when assessing chronic pain (1,2,5-12). Biobehavioral factors are defined as a set of psychological, environmental and psychophysiological processes (2). The psychological processes include cognitive perceptions such as perceived control over pain, helplessness and cognitive distortions or errors (2). Psychological variables such as belief in personal control over pain and low levels of perceived helplessness are accompanied by effective coping and adjustment to pain (13-14). Cognitive errors or distortions (beliefs about oneself or one's situation that are negatively distorted) have been shown to decrease the likelihood of active coping (15).

Catastrophizing, a specific cognitive error, has been identified as an important psychological variable in chronic pain (6). Although defining criteria for catastrophizing have never been explicitly stated, catastrophizing is generally considered to involve an exaggerated negative orientation toward noxious stimuli (7). Catastrophizing has been shown to be significantly correlated with higher levels of perceived pain intensity, functional disability and depression (2,6,16). Turk et al (15) have suggested that catastrophizing self-statements decrease the likelihood of active coping. Likewise, Spanos et al (17) found catastrophizing to be associated with low pain tolerance and higher ratings of pain intensity. These results suggest that biobehavioral factors such as catastrophizing have an impact on response to pain. Some investigators have hypothesized that these negative, maladaptive appraisals may reinforce the experience of inactivity and over reaction to nociceptive stimulation (6). This has led to the premise that maladaptive coping strategies are critical components of the chronic pain experience and that effective treatment necessitates an accurate assessment of these variables.

Various tools have been developed in an attempt to quantify the level of catastrophizing. Sullivan and Pivik (7) developed the Pain Catastrophizing Scale (PCS) by incorporating the nonredundant dimensions of catastrophizing that were identified by Spanos et al (17), Chaves and Brown (18), and Rosenstiel and Keefe (19). These included the tendency to increase attentional focus on pain-related thoughts (rumination), to exaggerate the threat value of pain stimuli (magnification) and to adopt a helpless orientation to coping with painful situations (helplessness) (7). To assess the validity of the PCS, Sullivan and Pivik (7) compared study participants' PCS responses to their responses in an interview-based procedure. This interview, previously used by Spanos et al (17), was designed to examine catastrophizing thought content. The interview was conducted following a cold water pressor immersion procedure. Sullivan and Pivik (7) found that catastrophizers (classified by the PCS) reported a higher frequency of catastrophizing thoughts than noncatastrophizers. Their research also showed that catastrophizers reported significantly more pain than noncatastrophizers and more emotional distress during the immersion. Thus, Sullivan and Pivik (7) concluded that the PCS is a valid index of catastrophizing ideation.

The present study examines catastrophizing ideation as measured by the PCS in a group of patients with chronic low back pain. Because the aim of treatment in chronic low back pain is often to improve the patients' function (20,21), the relationship between catastrophizing, disability, and reports of pain severity and intensity are examined. It is hypothesized that catastrophizing is significantly correlated with high levels of perceived disability, and pain severity and intensity.

PATIENTS AND METHODS

Patients studied: Forty patients 18 years of age or older, who had low back pain that fulfilled the criteria of having chronic low back pain with or without radiation to the legs for at least six months as their major pain complaint, were studied. They were referred out-patients of the Pain Management Unit at the Queen Elizabeth II Health Sciences Centre and were seen consecutively. Patients who had had pain from other conditions, such as neuropathies or cancer, that might influence disability reporting were excluded. All subjects gave written informed consent to participate in the study. The Institutional Research Review Committee granted approval for conducting the study.

Assessment of pain severity and intensity: All patients completed the one-page McGill Pain Questionnaire (MPQ). The MPQ is divided into three dimensions of pain, namely subjective, affective and evaluative. Subjects choose numerically weighted adjectives that best described their pain from these three dimensions. The Pain Rating Index (PRI) is the total score of the adjectives from the subjective, affective and evaluative dimensions. Because the PRI is the sum of adjectives from the three dimensions, it is considered a more global measure of pain severity. Higher PRIs reflect more severe levels of pain. Pain intensity is measured by the patient's scores on the Present Pain Intensity (PPI), which ranges from 0 – no pain to 5 – excruciating pain.

Assessment of disability: All subjects completed the Pain Disability Index (PDI). The PDI has been validated as a tool to measure functional disability in chronic pain patients (22). Subjects rated their level of disability in seven different areas

TABLE 1
Summary of scores for measured variables of 40 patients with chronic low back pain

Variable	Mean	SD	Range
PCS	26.80	11.90	3 – 46
PDI	43.38	12.33	21 – 63
PPI	2.64	0.96	1 – 5
PRI	37.12	12.00	6 – 64
# SITE	9.76	7.66	0 – 34
Duration (months)	106.85	114.28	8 – 516
Age (years)	44.75	9.71	28 – 76

PCS Total score on the Pain Catastrophizing Scale; PDI Total score on the Pain Disability Index (PDI); PPI Present Pain Intensity; PRI Pain Rating Index (severity); # SITE Number of pain sites

TABLE 2
Correlation among the Pain Catastrophizing Scale, the Pain Disability Index, Present Pain Intensity, the Pain Rating Index and duration of low back pain

	PCS	PDI	PPI	PRI
PCS	–	–	–	–
PDI	0.55**	–	–	–
PPI	0.39*	0.22	–	–
PRI	0.35*	0.29	0.19	–
Duration (months)	0.05	0.19	0.07	0.26

**P<0.05; **P<0.001. PCS Pain Catastrophizing Scale; PDI Pain Disability Index; PPI Present Pain Intensity; PRI Pain Rating Index (severity); Duration Duration of low back pain*

of everyday functioning: family and home responsibilities, recreation, social activity, occupation, sexual behaviour, self-care and life support activity. Ratings were given on a scale graded from 0 to 10, with 0 indicating no disability at all and 10 indicating total disability. Scores from each of the seven subscales were added together to provide a reflection of total disability in everyday functioning.

Assessment of catastrophizing: All subjects completed the PCS. The PCS is a self-report measure consisting of 13 statements that reflect pain-associated catastrophizing. Items 1 to 5 and 12 reflect the helplessness component of catastrophizing, items 6, 7 and 13 reflect magnification and items 8 and 11 reflect rumination (7). The subjects were asked to reflect on past painful episodes and to indicate the degree to which they experienced each of the 13 thoughts or feelings on a 5-point scale (0 – not at all, to 4 – all the time). Those scoring above 24 and below 15 on the PCS were classified as catastrophizers and noncatastrophizers, respectively.

RESULTS

Twenty-three of the subjects were men and 17 were women. Mean age was 44.75 years, SD ± 9.71. A description of the sample is presented in Table 1.

Student's *t* tests for independent samples were conducted on all dependent measures to examine sex differences; none were found. Pearson correlation coefficients were also computed to examine the relationship among the various measures (Table 2).

Correlational analysis revealed a positive correlation between catastrophizing and pain severity ($r=0.35$, $P<0.05$). Catastrophizing and pain intensity were also positively correlated ($r=0.39$, $P<0.05$). Pain severity and functional disability were not significantly correlated ($r=0.29$, $P<0.06$), nor were pain intensity and functional disability. Duration of pain was not correlated to any measured variable.

The strongest correlation existed between catastrophizing scores and overall functional disability ($r=0.55$, $P<0.001$). The relationship between functional disability and catastrophizing was explored further and showed that the helplessness component correlated most strongly with functional disability (Table 3).

TABLE 3
Helplessness and magnification correlations among total disability and the components of pain catastrophizing

	PDI	PCSHELP	PCSMAG
PDI	–	–	–
PCSHELP	0.55**	–	–
PCSMAG	0.48*	0.75**	–
PCSRUM	0.43*	0.73**	0.66**

**P<0.05; **P<0.001. PDI Pain Disability Index; PCSHELP Helplessness component of the Pain Catastrophizing Scale (PCS); PCSMAG Magnification component of the PCS; PCSRUM Rumination component of the PCS*

DISCUSSION

In this study, reports of catastrophizing were found to be related to higher reported levels of pain intensity. This finding supports the results of other studies (15-17). It has been proposed that a patient's thoughts during a painful event affect his or her level of pain tolerance, and that catastrophizing may cause a patient to have a heightened reactivity to pain and an exaggerated pain response (2,17). If this is true, rehabilitation may be especially challenging. This observation may explain why treatment attempts directed at the causative agent only result in less than ideal outcomes.

Reports of catastrophizing were also found to be positively correlated with functional disability. This relationship between catastrophizing and disability has been demonstrated in other studies (6,12), lending further support to a cognitive-behavioural aspect of chronic pain. Furthermore, in this study, reports of pain severity and intensity did not significantly correlate with reported levels of disability. This suggests that disability is not entirely a result of pain pathology and/or pain severity and intensity, and that negative cognitions are an important determinant in the response to chronic pain. It is likely that functional disability in chronic pain is caused by a number of factors that may or may not be related to physical impairment.

In this study, we found the helplessness component of the PCS to be most strongly related to disability. Flor and Turk (6) also found pain and disability to be positively correlated with helplessness. It is possible that individuals' feelings of helplessness prevent them from attempting activities of daily living. If individuals believe that their pain will remain severe, regardless of their efforts, they will be more apt to remain inactive and eventually become functionally disabled.

Because treatment should be directed at improving a person's daily functioning, treatment directed at changing the disease pathology will fall short of the treatment goal. This study suggests that efforts at decreasing disability will be more successful if they are directed towards the cognitive-behavioural aspect of chronic pain. Psychological variables need proper initial assessment so that methods for addressing these issues can be included in treatment. The PCS appears to be a useful tool for identifying those patients who would benefit from a psychological component in treatment.

There are several limitations of this study. First, all patients were recruited from an out-patient, tertiary care pain management unit. This may have resulted in an over-representation of both psychological distress and/or functional disability in the patients. However, because this was a relatively homogeneous sample, there is still a confirmation and extension of the validity of the PCS from previous findings. Second, all the data were obtained from patient self-report. Although this method of data collection is commonly used for assessing pain, functional limitations and cognitions, the use of objective measures of functional disability, and observations of thoughts and feelings during a pain experience may add strength to the results. Third, as only one type of chronic pain condition (chronic low back pain) was studied, it is not possible to generalize the findings regarding functional disability to other patient populations.

Although a significant relationship was found between catastrophizing and both pain severity and intensity and functional disability, conclusions about causal relationships cannot be made. Whether catastrophizing leads to functional impairment or whether high levels of disability lead to cognitive distortions, such as catastrophizing, is unknown. We also cannot determine whether catastrophizing leads to increased perception of pain nor if heightened pain reactivity predisposes a patient to a catastrophizing ideation. Future research should examine the relationship between changes in cognitive distortions, and dysfunction and pain severity over time.

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