Catastrophizers with chronic pain display more pain behaviour when in a relationship with a low catastrophizing spouse

Nathalie Gauthier MPs1, Pascal Thibault PhD2, Michael JL Sullivan PhD2

The present study examined the relationship between couple concordance of catastrophizing and adverse pain outcomes. Possible mechanisms underlying the relationship between couple concordance of catastrophizing and pain outcomes were also explored. Fifty-eight couples were recruited for the study. The chronic pain patients were filmed while lifting a series of weighted canisters. The spouse was later invited to view the video and answer questions about the pain experience of their partner. Median splits on Pain Catastrophizing Scale scores were used to create four 'catastrophizing concordance' groups: low catastrophizing patient-low catastrophizing spouse; low catastrophizing patient-high catastrophizing spouse; high catastrophizing patient-low catastrophizing spouse; and high catastrophizing patient-high catastrophizing spouse. Analyses revealed that high catastrophizing high pain patients who were in a relationship with a low catastrophizing spouse displayed more pain behaviours than patients in all other groups. These findings suggest that high catastrophizing chronic pain patients may need to increase the 'volume' of pain communication to compensate for low catastrophizing spouses' tendency to underestimate the severity of their pain experience. Patients' perceived solicitousness and punitive response from the spouse could not explain the group differences in pain behaviour. Theoretical and clinical implications of the findings are discussed.

Key Words: Catastrophizing; Communal coping model; Couple concordance; Pain behaviours; Pain communication; Persistent pain

In recent years, there has been increased interest in examining interpersonal and relational aspects of pain. Spouse or partner characteristics, such as distress, solicitousness, support and level of catastrophizing, have been shown to be associated with pain patients' level of pain and emotional distress (1,2). The present study addressed the relationship between patient and spouse concordance of catastrophizing and pain outcomes.

Numerous investigations have shown that high levels of pain catastrophizing by pain patients are associated with heightened pain, emotional distress, pain behaviour and pain-related disability (3). According to the communal coping model of pain catastrophizing (4), the pain expressions of high catastrophizers serve a social communicative function aimed at maximizing the probability that distress will be managed within a social/interpersonal context. Sullivan et al (3) suggested that high catastrophizers may engage in exaggerated pain expression to maximize proximity, or to solicit assistance or empathic responses from others. Catastrophizers' expressive pain displays may also be used to induce others to alter their expectations, reduce performance demands or manage interpersonal conflicts.

Communication models of pain (5,6) propose that pain communication is a joint function of characteristics of the sender and the receiver. Senders may vary in their ability to effectively communicate pain, and receivers may vary in their ability to accurately interpret the pain communications they receive. To date, research has shown that high pain catastrophizers display more pain behaviour than low pain catastrophizers (7-10), and are more effective than low catastrophizers in accurately communicating their pain (8). Research has also shown that the level of catastrophizing of the observer influences how pain behaviours are interpreted (11). Specifically, low catastrophizers appear to be particularly prone to underestimating others' pain (11,12).

Proceeding from a communication perspective on pain catastrophizing, it could be predicted that the highest levels of physical and emotional distress would be seen in couples for whom the pain patient is a high catastrophizer and the spouse is a low catastrophizer. Under these conditions, the high catastrophizing pain patient may need to increase the 'volume' of pain communication to compensate for the low catastrophizing spouses' tendency to underestimate pain signals.

In contrast to a communication perspective on pain catastrophizing, cognitive-behavioural models suggest that pain catastrophizing represents an appraisal process that is characterized by alarmist interpretations of pain or other health threats (13-16). High threat appraisals are expected to contribute to increased physical and emotional
Quebec. Eligible participants were individuals between 20 and 55 years suffering from persistent neck or back pain, and their spouses. Participants The study sample consisted of 58 individuals (30 men and 28 women) suffering from persistent neck or back pain, and their spouses. Participants or punishing factors that could explain variations in pain outcomes. Punitive responses from the spouse were examined as possible reinforcing factors that could be adversely affected by the lifting task. The mean age of the sample included English- and French-speaking participants.

METHODS

Participants
The study sample consisted of 58 individuals (30 men and 28 women) suffering from persistent neck or back pain, and their spouses. Participants were recruited through advertisements placed in newspapers in Montreal, Quebec. Eligible participants were individuals between 20 and 55 years of age, who had been experiencing back or neck pain for more than six months and were currently in a relationship (married or common law). All participants were examined by a physician or an occupational therapist to identify and exclude participants with a medical condition contraindicating the safety of the study. All procedures were approved by the research ethics board of the Centre for Interdisciplinary Research in Rehabilitation of Greater Montreal.

Procedure
All procedures were approved by the research ethics board of the Centre for Interdisciplinary Research in Rehabilitation of Greater Montreal. On patients’ arrival at the laboratory, a research assistant informed the patient and spouse that the study focused on the impact of persistent pain on couples. Informed consent was obtained from patients and their spouses. Pain patients completed the McGill Pain Questionnaire (MPQ [17,18]), the Beck Depression Inventory-II (BDI-II [19]), the Pain Catastrophizing Scale (PCS [22,23]) and the Multidimensional Pain Inventory-Patient Version (MPI [24,25]). Spouses completed the BDI-II (19) and the PCS (for their own catastrophizing level) (22,23).

Pain patients completed a simulated occupational lifting task modelled after Butler and Kosey’s model (26), while their spouses sat in a waiting room out of sight of the laboratory. Patients were asked to stand behind a waist-level table with 18 canisters partially filled with sand, weighing 2.9 kg, 3.4 kg and 3.9 kg. The canisters were placed in three rows of six columns, with the different weights and positions arranged according to a double Latin square. The selection of loads was based on research suggesting a 12% weight difference for detection threshold and the National Institute for Occupational Safety and Health’s recommendations for safety weight limits (27,28).

The patients lifted each canister under two instructional sets: weight estimation and pain rating. For the weight estimation task, patients lifted the canisters in a predetermined order and estimated the weight of each canister. For the pain rating task, patients lifted each canister in the same order and rated their pain on a scale from 0 (no pain) to 10 (extreme pain). The weight estimation and pain rating tasks were counterbalanced across patients.

The canister locations required the adoption of three different functional anthropometric postural positions: normal, maximum and extreme reaches. For canisters in the first row (closest to the body), participants stood erect with the elbow of their dominant arm bent at 90 degrees (Position 1); for canisters in the second row, participants stood erect with their dominant arm fully extended (Position 2); and for canisters in the third row, the participant’s trunk was forward flexed with his/her dominant arm fully extended (Position 3). The task was designed such that the trunk forward flexion and arm extension required to lift canisters farther away from the body would engage the musculature of the upper limbs, cervical and lumbar spine.

A research assistant was present in the laboratory to record the responses (ie, weight estimates and pain ratings) of the patient. The patient was informed that the lifting task was being video recorded, and that the spouse would later be invited to view the video and respond to questions about his/her pain experience.

Measures

Catastrophizing: The PCS (22,23) was used as a measure of catastrophic thinking related to pain. The PCS consists of 13 items describing different thoughts and feelings related to pain. For each item, respondents rate the frequency at which they experience each thought or feeling on a five-point scale with end points of 0 (not at all) and 4 (all the time). The scores on the PCS range from 0 to 52. Numerous investigations have supported the reliability and the validity of the PCS as a measure of pain-related catastrophic thinking (4,23,29,30).

Pain severity: The MPQ (17,18) was used as an index of pain severity. The Pain Rating Index (PRI) of the MPQ is derived as the weighted sum of values corresponding to pain adjectives endorsed by the respondent to describe his/her pain. MPQ PRI scores range from 0 to 78. The MPQ PRI is considered to be a reliable and valid index of an individual’s chronic pain experience (31). Patients also rated their present pain intensity on an 11-point scale with the end points 0 (no pain) and 10 (extreme pain).

Depression: The BDI-II is a widely used self-report measure of depression composed of 21 items describing symptoms of depression (19). Respondents are asked to endorse statements that best describe how they have been feeling during the past two weeks. The BDI-II has been shown to be a reliable (coefficient α=0.84) and valid index of depressive symptoms experienced by persistent pain patients and primary care medical patients (32,34).

Disability: The PDI (20,21) was used as a self-report measure of functional disability. On this scale, respondents are asked to rate their level of disability in seven different areas of daily living (home, social, recreational, occupational, sexual, self-care and life support) (35). For each life domain, respondents provide disability ratings on 11-point scales with end points of 0 (no disability) and 10 (total disability). The PDI has been shown to be internally reliable and significantly correlated with objective indexes of disability (21,36).

Patients’ perception of spouse responses to pain: The MPI (24,25) is a 52-item inventory designed to assess psychosocial components of chronic pain experience. The MPI was used to measure patients’ perception of spouse punishing (four items), solicitous (six items) and distracting (four items) responses to pain on a seven-point Likert scale ranging from 0 (never) to 6 (very often). The MPI has been shown to have good construct and discriminant validity, internal consistency and test-retest reliability (24,25).

Spouses’ pain estimates: Spouses were asked to view the video (without audio) of the pain rating task that was completed by their partner and to estimate, for each canister lifted, the level of pain of their
partner on a scale from 0 (no pain) to 10 (extreme pain). Spouse’s pain estimates weren’t averaged across the 18 canisters so that the variable ranged from 0 (no pain) to 10 (extreme pain).

**Pain behaviours:** Two judges who were blinded to experimental hypotheses and trained in a pain behaviour coding procedure described by Sullivan et al (37), independently coded each video for the presence of communicative and protective pain behaviours. Communicative pain behaviours included facial expressions such as grimacing or wincing, and verbal or paraverbal pain expressions such as pain words, grunts, sighs and moans. Protective pain behaviours included movements such as guarding, holding, touching or rubbing.

For each canister, the duration of communicative and protective pain behaviours was recorded. For facial expressions, judges rated the intensity of each facial expression as either mild, moderate or intense. Composite indexes of facial expressions were computed by multiplying the duration of pain behaviour by its intensity and summing across all 18 canister lifts (38). Intensity was not rated for protective pain behaviours because previous research from the laboratory revealed that behaviours such as rubbing, holding, touching or guarding are not readily characterized in terms of intensity. Therefore, only duration was recorded for protective pain behaviours. The mean correlation between judges’ coding for the duration of each category of pain behaviour was 0.86. For the duration of pain behaviour, the scores of the two judges were averaged. The mean percentage agreement for the classification of each category of pain behaviour was 86%. Discrepancies were resolved through discussion. For the purpose of the present article, a composite pain behaviour score was derived as the sum of all the pain behaviours across the two tasks.

**Data analysis approach:** Patients and spouses were classified as high catastrophizers or low catastrophizers based on a median split (median = 24) of their scores on the PCS (22,23). Thus, four ‘catastrophizing concordance’ groups were created: low catastrophizing patient-low catastrophizing spouse; low catastrophizing patient-high catastrophizing spouse; high catastrophizing patient-low catastrophizing spouse; and high catastrophizing patient-high catastrophizing spouse.

ANOVA with repeated measures were used to assess the effects of patient and spouse’s catastrophizing levels, canister weight and canister position on pain ratings, pain behaviours, depression, disability and spouses’ pain estimates. Initial analyses revealed that lighter canisters elicited a low frequency of pain behaviours such that several cells in the design contained only null values. Therefore, pain behaviours were summed across different weight canisters, removing canister weight as a factor in the analyses of pain behaviours. Because there was no significant effect involving sex for variables of interest, this variable was dropped from further analysis.

Before analysis, scores of pain behaviours, pain ratings and patient PCS scores were examined for multivariate outliers. By using Mahalanobis distance squared with P<0.05, eight participants were identified as multivariate outliers and excluded from further analysis, thus reducing the sample size to 50 couples.

Examination of the normality of the different variables revealed that the distribution of the total amount of pain behaviours was positively skewed. Therefore, a square root transformation on the total amount of pain behaviour was performed, and all analyses used the square root test variable (39). Transformed variables do not represent a real unitary value of the original variable. However, the relationships between transformed variables and other (untransformed) variables are not affected. Although analyses were conducted on the square root transformation of the pain behaviour variables, the untransformed means and SDs are presented in the tables and figures.

**RESULTS**

Table 1 presents the means and SDs for patients’ depression and pain scores as a function of couple concordance of pain catastrophizing.

**Table 1**

**Sample characteristics: Pain patients and their spouses**

<table>
<thead>
<tr>
<th></th>
<th>Pain patients</th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>Men (n=26)</td>
<td>Women (n=24)</td>
<td>P</td>
</tr>
<tr>
<td>Pain duration, years</td>
<td>40.8±8.0</td>
<td>39.4±10.6</td>
<td>0.59</td>
</tr>
<tr>
<td>Relationship duration, years</td>
<td>6.9±9.9</td>
<td>8.5±6.4</td>
<td>0.35</td>
</tr>
<tr>
<td>Mean pain during the lifting task</td>
<td>10.04±7.3</td>
<td>12.3±11.7</td>
<td>0.41</td>
</tr>
<tr>
<td>MPQ-PPI</td>
<td>3.3±2.1</td>
<td>4.4±2.7</td>
<td>0.09</td>
</tr>
<tr>
<td>MPQ-PRF</td>
<td>4.9±2.0</td>
<td>4.1±2.4</td>
<td>0.20</td>
</tr>
<tr>
<td>MPQ-number of pain sites</td>
<td>23.0±13.1</td>
<td>29.0±16.6</td>
<td>0.16</td>
</tr>
<tr>
<td>PDI</td>
<td>21.3±12.0</td>
<td>30.0±15.4</td>
<td>0.24</td>
</tr>
<tr>
<td>BDI-II</td>
<td>12.9±8.1</td>
<td>15.5±10.9</td>
<td>0.34</td>
</tr>
<tr>
<td>PCS</td>
<td>23.7±9.4</td>
<td>27.1±13.1</td>
<td>0.30</td>
</tr>
</tbody>
</table>

**Spouses**

| Age, years             | Men (n=25)    | Women (n=25) | P    |
| Pain duration, years   | 43.4±11.4     | 36.6±11.1  | 0.04 |
| BDI-II                | 8.9±8.3       | 11.4±8.6  | 0.30 |
| PCS                   | 28.0±13.0     | 22.8±9.0  | 0.95 |
| Mean perceived pain during the lifting task | 4.1±2.1 | 2.6±2.0 | 0.01 |

Data presented as mean ± SD. BDI-II Beck Depression Inventory-II; MPQ McGill Pain Questionnaire; PCS Pain Catastrophizing Scale; PDI Pain Disability Index; PPI Present Pain Intensity; PRI Pain Rating Index

Table 2 presents correlations between all pain-related variables and patients’ pain behaviours. Consistent with previous research, catastrophizing (PCS), fear of movement/re-injury (Tampa Scale for Kinesiophobia) and self-reported disability were significantly correlated with pain behaviour (9,37).

**Table 3**

**Pain behaviours of catastrophizers**

<p>| | | |</p>
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**Table 3**

**Pain patients**

|                        |                          |                |

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**Patients’ pain ratings**

Patients’ pain ratings were analyzed using a three-way ANOVA (level of patient catastrophizing × level of spouse catastrophizing as between-subject factors), with canister position as the repeated measure factor. This analysis revealed a marginally significant main effect for level of patient catastrophizing (F[1,50]=3.31, P=0.08); high catastrophizers reported slightly more intense pain (mean ± SD 4.3±2.9) than low catastrophizers (mean 3.0±2.0). A significant main effect for canister position also emerged (F[2,90]=3.2, P<0.01). Tests of simple effects revealed that lifting canisters in the third row (farthest away from the body) induced significantly more pain (mean 4.5±2.7) than canisters in the middle (mean 3.9±2.6; t[49]=4.75, P<0.001) or in the first row (mean 3.1±2.3; t[49]=7.74, P<0.001). There were no significant interaction effects.

**Patients’ self-reported disability and depression**

A two (high catastrophizing patient-low catastrophizing patient) by two (high catastrophizing spouse-low catastrophizing spouse) multivariate ANOVA was conducted on patients’ self-reported disability and depression. This analysis revealed a significant main effect for level of patient catastrophizing (F[2,45]=18.4, P<0.001), which was univariately significant for both self-reported disability and depression. Specifically, patients demonstrating high levels of catastrophizing reported greater disability (mean 26.4±15.2) than patients with low levels of catastrophizing (mean 21.3±12.6). In addition, patients with high levels of catastrophizing reported greater depression symptoms (mean 15.8±11.6) than patients with low levels of catastrophizing (mean 12.9±10.2).

Table 4 presents the means and SDs for patients’ depression and pain scores as a function of couple concordance of pain catastrophizing.

**Table 4**

**Sample characteristics: Pain patients and their spouses**

|                        |                          |                |

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**Table 3**

**Pain patients**

<table>
<thead>
<tr>
<th>Age, years</th>
<th>Pain duration, years</th>
<th>Relationship duration, years</th>
<th>Mean pain during the lifting task</th>
<th>MPQ-PPI</th>
<th>MPQ-PRF</th>
<th>MPQ-number of pain sites</th>
<th>PDI</th>
<th>BDI-II</th>
<th>PCS</th>
<th>Mean perceived pain during the lifting task</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>40.8±8.0</td>
<td>6.9±9.9</td>
<td>10.04±7.3</td>
<td>3.3±2.1</td>
<td>4.9±2.0</td>
<td>23.0±13.1</td>
<td>21.3±12.0</td>
<td>12.9±8.1</td>
<td>23.7±9.4</td>
<td>4.1±2.1</td>
<td>2.6±2.0</td>
<td>0.86</td>
<td>0.09</td>
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<tr>
<td>39.4±10.6</td>
<td>8.5±6.4</td>
<td>12.3±11.7</td>
<td>4.4±2.7</td>
<td>4.1±2.4</td>
<td>29.0±16.6</td>
<td>30.0±15.4</td>
<td>15.5±10.9</td>
<td>27.1±13.1</td>
<td>2.6±2.0</td>
<td>0.01</td>
<td>0.35</td>
<td>0.24</td>
</tr>
</tbody>
</table>

**PDI** | 21.3±12.0 | 30.0±15.4 | 0.24

**BDI-II** | 12.9±8.1 | 15.5±10.9 | 0.34

**PCS** | 23.7±9.4 | 27.1±13.1 | 0.30

**Mean perceived pain during the lifting task** | 4.1±2.1 | 2.6±2.0 | 0.01

**Data presented as mean ± SD. BDI-II Beck Depression Inventory-II; MPQ McGill Pain Questionnaire; PCS Pain Catastrophizing Scale; PDI Pain Disability Index; PPI Present Pain Intensity; PRI Pain Rating Index**
TABLE 2
Correlations between pain-related variables and pain behaviours

<table>
<thead>
<tr>
<th></th>
<th>MPQ-PPI</th>
<th>MPQ-PRI</th>
<th>BDI-II</th>
<th>PCS</th>
<th>TSK</th>
<th>PDI</th>
<th>P-PCS</th>
<th>Punitive</th>
<th>Solicit</th>
<th>Distract</th>
<th>Behav</th>
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<tr>
<td>MPQ-PPI</td>
<td>0.31*</td>
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<tr>
<td>MPQ-PRI</td>
<td>0.32*</td>
<td>0.44**</td>
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<tr>
<td>BDI-II</td>
<td>0.31*</td>
<td>0.50**</td>
<td>0.60**</td>
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<tr>
<td>PCS</td>
<td>0.23</td>
<td>0.34*</td>
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<tr>
<td>TSK</td>
<td>0.39**</td>
<td>0.30*</td>
<td>0.34*</td>
<td>0.50**</td>
<td>0.56**</td>
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<tr>
<td>P-PCS</td>
<td>0.04</td>
<td>0.18</td>
<td>0.09</td>
<td>0.18</td>
<td>0.31*</td>
<td>0.07</td>
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<tr>
<td>Punitive</td>
<td>-0.01</td>
<td>0.18</td>
<td>0.13</td>
<td>0.26</td>
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<td>0.07</td>
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<tr>
<td>Solicit</td>
<td>-0.11</td>
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<td>-0.03</td>
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<td>0.20</td>
<td>0.14</td>
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<td>-0.31*</td>
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<tr>
<td>Distract</td>
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<td>-0.12</td>
<td>-0.04</td>
<td>0.04</td>
<td>-0.09</td>
<td>-0.02</td>
<td>0.20</td>
<td>-0.21</td>
<td>0.41**</td>
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<tr>
<td>Behav</td>
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<td>0.11</td>
<td>0.11</td>
<td>0.27**</td>
<td>0.31*</td>
<td>0.47**</td>
<td>-0.19</td>
<td>-0.13</td>
<td>0.34*</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

**P<0.05; ***P<0.01. BDI-II Beck Depression Inventory-II; Behav Pain behaviours; Distract Distractive responses; MPQ-PPI McGill Pain Questionnaire – Present Pain Intensity; MPQ-PRI MPQ – Pain rating index; PCS Pain Catastrophizing Scale; PDI Pain Disability Index; P-PCS PCS completed by the spouse; Punitive Punitive responses; Solicit Solicitous responses; TSK Tampa Scale for Kinesiophobia

TABLE 3
Patient and spouse concordance of pain catastrophizing

<table>
<thead>
<tr>
<th>Spouse catastrophizing type</th>
<th>Patient catastrophizing type</th>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td></td>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td>15</td>
<td>14</td>
</tr>
</tbody>
</table>

TABLE 4
Depression and pain scores as a function of couple concordance of pain catastrophizing

<table>
<thead>
<tr>
<th>Patient catastrophizing type</th>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient depressive symptoms (BDI-II)</td>
<td>18.88±6.86</td>
<td>6.00±4.30</td>
</tr>
<tr>
<td>Low catastrophizing spouse</td>
<td>18.07±11.57</td>
<td>7.43±4.18</td>
</tr>
<tr>
<td>Spouse depressive symptoms (BDI-II)</td>
<td>15.19±10.51</td>
<td>11.00±7.71</td>
</tr>
<tr>
<td>Low catastrophizing spouse</td>
<td>6.60±4.85</td>
<td>8.00±6.76</td>
</tr>
<tr>
<td>Patient pain ratings (MPQ-PPI)</td>
<td>4.75±2.08</td>
<td>3.40±1.82</td>
</tr>
<tr>
<td>High catastrophizing spouse</td>
<td>4.75±2.10</td>
<td>3.57±2.24</td>
</tr>
<tr>
<td>Patient pain ratings during the lifting task</td>
<td>4.24±2.88</td>
<td>2.88±2.25</td>
</tr>
<tr>
<td>Low catastrophizing spouse</td>
<td>4.32±3.37</td>
<td>2.99±1.95</td>
</tr>
</tbody>
</table>

Data presented as mean ± SD. BDI-II Beck Depression Inventory-II; MPQ-PPI McGill Pain Questionnaire – Present Pain Intensity

Patients’ pain behaviour

A three-way ANOVA (level of participant catastrophizing × level of spouse catastrophizing as between-subject factors), with canister position as the repeated measure factor, was conducted on the total pain behaviour scores. The analysis revealed a significant main effect for level of patient catastrophizing (F[1,46]=11.16, P<0.002). This main effect was qualified by a significant level of patient catastrophizing × level of spouse catastrophizing (F[1,46]=4.03, P<0.05). Tests of simple effects revealed that high catastrophizing patients in a relationship with low catastrophizing spouses expressed more pain behaviours as a result of more intense pain, more severe depression or more disability (9.41-46). A hierarchical regression was, therefore, conducted to examine the relative contribution of pain intensity, depression and self-reported disability to group differences in pain behaviour between high catastrophizing participants with high or low catastrophizing spouses. As shown in Table 5, pain, depression and self-reported disability were entered in step 1 of the analysis. Group type (high catastrophizing patient-high catastrophizing spouse versus high catastrophizing patient-low catastrophizing spouse) was entered in step 2 of the analysis, and contributed significant variance to the prediction of the total amount of pain behaviours. Group type accounted for 22% of the variance in pain behaviours, beyond the variance accounted for by pain intensity, depression and self-reported disability. Examination of the beta weights indicated that, in the final regression equation, self-reported disability and Group type contributed unique variance to the prediction of the total amount of pain behaviours.

Spouse’s pain estimates

Spouses’ pain estimates were analyzed using a three-way ANOVA (level of patient catastrophizing × level of spouse catastrophizing as between-subject factors), with canister position as the repeated measures factor. A significant main effect for level of patient catastrophizing emerged (F[1,49]=6.64, P<0.01), as well as a marginally significant main effect for level of spouse catastrophizing (F[1,49]=3.80, P<0.06). Spouses of high catastrophizing patients perceived more pain (mean 4.0±2.3) than spouses of low catastrophizing patients (mean 2.3±1.4). High catastrophizing spouses perceived significantly more pain (mean 4.3±2.5) than low catastrophizing spouses (mean 2.6±1.6).

Figure 1) Pain behaviour level for the different couple concordances of pain catastrophizing

Pain Res Manage Vol 16 No 5 September/October 2011
Pain behaviours of catastrophizers

Consistent with previous research using this paradigm (12), canister position also emerged as a significant contributor of spouse's pain estimates (F[2,90]=37.9, P<0.001). Tests of simple effects revealed that spouses perceived more pain when their partner lifted canisters in the third row (mean 4.2±2.5) compared with the second (mean 3.5±2.2; t[48]=4.25, P<0.001) or first row (mean 2.4±2.1; t[48]=8.74, P<0.001).

A two-way ANOVA (level of patient catastrophizing × level of spouse catastrophizing) was conducted on patients’ perception of solicitous response from the spouse. No main or interaction effect emerged.

A two-way ANOVA (level of patient catastrophizing × level of spouse catastrophizing) was conducted on patients’ perception of punishing response from the spouse. The analysis revealed a marginally significant main effect for level of patient catastrophizing (F[1,45]=3.19, P=0.08), where high catastrophizers reported slightly more punishing responses (mean 1.9±1.3) than low catastrophizers (mean 1.6±1.2). This effect was qualified by a marginally significant interaction (F[1,45]=3.36, P=0.08), revealing a trend for patients to perceive more punishing responses from their spouses when both partners were high catastrophizers.

A hierarchical regression was performed to examine the relative contribution of high catastrophizing patients’ perception of punishing responses from their spouses in the prediction of pain behaviours. As shown in Table 6, spouse catastrophizing was entered in step 1 of the analysis. In step 2, the perceived punishing response was entered. Pain, depression and self-reported disability were entered in step 3. Group type and self-reported disability contributed unique variance to the prediction of the total amount of pain behaviours. Specifically, group type accounted for 15% of the variance and self-reported disability accounted for 20% of the variance.

**DISCUSSION**

The primary aim of the present study was to assess the relationship between couple concordance of catastrophizing and adverse pain outcomes. Consistent with previous research, high scores on the PCS (for pain patients) were associated with more intense pain (7-10), more severe depression and more pronounced disability (47-49).

It was also found that high catastrophizing spouses perceived significantly more pain. This finding is consistent with previous research showing that catastrophizers are more sensitive to pain cues of other people (11). Similar to their own catastrophizing levels, spouses of high catastrophizing patients perceived slightly more pain in their partners. This result is consistent with previous research suggesting that catastrophizers may be more effective communicators of their pain experience (8).

Of central interest in the present study were the interactive or summative effects of participants’ and their spouses’ levels of catastrophizing on patients’ pain outcomes. Results indicated that spouse level of catastrophizing interacted with patient level of catastrophizing only for the display of pain behaviour. Specifically, high catastrophizing patients who were in a relationship with a low catastrophizing spouse displayed the greatest amount of pain behaviour. A hierarchical regression revealed that couple concordance of catastrophizing accounted for 22% of the variance in pain behaviour scores, beyond the variance accounted for by pain intensity, depression and self-reported disability.

Proceeding from a cognitive-behavioural perspective, the highest levels of pain behaviour might have been expected in couples for whom both partners were high catastrophizers. In other words, a summative effect of the heightened threat appraisals of both members of the catastrophizing couple would have contributed to more intense emotional distress and pain and, in turn, to more pain behaviour.

Cano et al (1) reported finding an interaction between patient and spouse catastrophizing and emotional distress. When both spouses were high catastrophizers, the pain patients reported significantly more depressive symptoms than high catastrophizers who were in relationships with low catastrophizers (1). Cano et al interpreted their findings by suggesting that pain catastrophizing in both spouses could result in specific behaviours (ie, a worried pain participant in a relationship with a solicitous spouse, in which both partners are focused on the pain problem) that may exacerbate depressive symptoms experienced by the pain participant. The results of the present study do not replicate this effect. It is possible that cross-sample differences in measurement instruments, sample composition or chronicity might have accounted for the discrepancy in findings. It is important to note that in the Cano et al (1) study, spouses’ catastrophizing about their partner’s pain was assessed. In the present study, spouses’ catastrophizing about their own pain was assessed.

The findings of the present study support a communication perspective of pain catastrophizing. It is possible that the high catastrophizing chronic pain patient might need to increase the ‘volume’ of pain communication to compensate for the low catastrophizing spouses’ tendency to underestimate pain signals. In communication studies, researchers have proposed a hierarchy hypothesis that suggests that when individuals believe that their communication goals are not achieved, they will choose the least cognitively demanding option to achieve, they will choose the least cognitively demanding option to achieve the greatest amount of pain behaviour. A hierarchical regression revealed that couple concordance of catastrophizing accounted for 22% of the variance in pain behaviour scores, beyond the variance accounted for by pain intensity, depression and self-reported disability.

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Operant explanations have previously been invoked to account for heightened expressions of pain behaviour (46,52). In previous research, significant relationships were reported between spouse solicitousness and patient pain behaviour (52-55). Similar findings were obtained in the present study. It could be suggested that pain behaviour might be reinforced by solicitous behaviours from the spouse (eg, expressions of...
such as pain behaviours. Interventions aimed at improving the communication skills (active listening) of the partners should be considered, specifically for couples in whom the patient is a high catastrophizer and the spouse is a low catastrophizer (64).

A certain degree of caution needs to be exercised in the interpretation of the present findings. First, because the participants were recruited through newspaper advertisements, the sample may not be representative of the patients attending pain treatment centres. In addition, the modest sample size limits the nature of the relationships that could be explored, and permits elucidation of only relationships associated with moderate or large effect sizes. Pain behaviour was also assessed under standardized laboratory conditions, with the partner in a separate room, who only saw the video without sound. While such conditions are important from the perspective of scientific rigor, they also strain the ecological validity of the findings.

In spite of these limitations, the present study is the first to demonstrate that concordance of pain catastrophizing in couples, where one partner suffers from persistent pain, influences the display of pain behaviour. More research is needed to identify the mechanisms that underlie this interaction.

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