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The role of pain behaviour and family caregiver responses in the link between pain catastrophising and pain intensity: A moderated mediation model

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Objectives: This study investigated the mediating role of pain behaviours in the association between pain catastrophising and pain intensity and explored the moderating role of family caregivers’ responses to pain in the link between pain behaviours and pain intensity.

Methods: The sample consisted of 154 chronic pain patients and their family caregivers. Patients completed questionnaires regarding pain intensity, pain catastrophising, pain behaviours and their caregivers’ responses to their pain. Family caregivers reported their responses to the patients’ pain.

Results: Pain catastrophising was associated with pain intensity ($r = 0.37$) and pain behaviours partly mediated this association. The positive association between pain behaviours and pain intensity was significant only if patients reported that their family caregivers showed high levels of solicitous (effect = .49) and distracting responses (effect = .58), and if caregivers reported to show high levels of solicitous responses (effect = .51). No support was found for negative responses as a moderator neither based on patients’ perception of negative responses nor based on caregivers’ perception of negative responses.

Conclusions: The findings are in line with the idea that family caregivers’ solicitous and distracting responses convey to patients that their condition is serious, which may reinforce patients’ pain and pain behaviours, especially in those who catastrophise.

Keywords: catastrophising; pain behaviours; pain intensity; family caregivers; responses

Introduction

Pain is one of the main reasons for hospitalisation and has been considered as the fifth vital sign (Nascimento & Kreling, 2011). Knowing the factors that influence the pain experience is essential for providing the optimal pain management for patients with chronic pain. One of the factors that can influence the perception of pain is pain

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catastrophising (Crombez, Vlaeyen, Heuts, & Lysens, 1999; Severeijns, Vlaeyen, & van den Hout, 2004). Pain catastrophising is defined as a tendency to exaggerate the threat value of pain and its consequences (Sullivan, Bishop, & Pivik, 1995). Prospective studies have shown that pain catastrophising is an important predictor of pain intensity (Forsythe, Dunbar, Hennigar, Sullivan, & Gross, 2008; Parr et al., 2012). To explain the relationship between pain catastrophising and pain intensity, studies have suggested that individuals who catastrophise about pain may show higher pain-related fear that can cause activity avoidance and intolerance, which results in experiencing more negative outcomes such as more severe pain (George, Dover, & Fillingim, 2007; Parr et al., 2012). However, the role of behavioural factors in the association between pain catastrophising and pain intensity have remained largely unexplored. To fill this gap, this study aims to investigate the role of patients’ pain behaviours and caregivers’ responses in patients’ pain intensity.

Patients’ pain behaviours and expressions may mediate the association between pain catastrophising and pain intensity. The communal coping model (Sullivan, Tripp, & Santor, 2000) posits that pain catastrophising has a communicative function. That is, patients who catastrophise about pain are more likely to express their pain—intentionally or not—by means of guarding, rubbing, and pain-related facial expressions (Martel, Thibault, & Sullivan, 2010; Severeijns et al., 2004). Some pain behaviours have a protective function and tend to decrease the pain (e.g. rubbing). Learning models suggest that this protective function can reinforce pain behaviours (Linton & Shaw, 2011). While in the short-term, the protective function of some pain behaviours can reduce the pain intensity, in the long-term persistent pain behaviours may develop into disability, ultimately resulting in experiencing more persistent and intensive pain (Gatzounis, Schrooten, Crombez, & Vlaeyen, 2012; Labus, Keefe, & Jensen, 2003; Linton & Shaw, 2011). Therefore, based on the learning models, we expect to see that pain behaviours mediate the relationship between pain catastrophising and pain intensity in patients with chronic pain.

In addition, the relationship between pain behaviours and pain intensity itself can be influenced by other factors such as caregivers’ responses. Communal coping models posit that pain behaviours exhibited by patients can convey patients’ pain experience to their family caregivers and significant others (Hadjistavropoulos & Craig, 2002; Sullivan, 2012; Sullivan, Martel, Tripp, Savard, & Crombez, 2006). Therefore, they increase the chance of evoking a supportive response from them (Martin, Tuttle, & Mogil, 2014; Williams & Craig, 2006), such as solicitous (e.g. taking over patients’ duties) and distracting (e.g. encouraging patients to do other activities) responses. While we expect caregivers to always show caring and supporting responses to the patients’ pain, caregivers may differ in their abilities, resources, and motives (Collins & Ford, 2010). These factors, and changes in these factors over time, may impact caregivers’ responses. For example, some caregivers might experience more burden and lower psychological well-being as a result of long-term caregiving and express more negative behaviour in response to the patients’ expressions of pain (e.g. expressing frustration with the patient). Therefore, patients’ expression of pain does not necessarily result in receiving positive and solicitous caregiver responses, and sometime may even result in negative responses.

The literature suggests that family caregivers’ responses, including solicitous, distracting, and even negative responses do have an influence on the pain experience.
It is shown that family caregivers’ supportive responses such as solicitous responses convey the notion to patients that their condition is serious (Rosen, Bergeron, Glowacka, Delisle, & Baxter, 2012). In other words, patients who catastrophise and show pain behaviours may be confirmed in their notion that the pain is serious, which in turn may fuel their perception of pain. Therefore, we posit that it is likely that the relationship between pain behaviours and pain intensity is stronger in patients who receive highly solicitous responses compared to the patients who receive fewer solicitous responses. In the same way, caregivers’ distracting responses might also influence the relationship between pain behaviours and pain intensity. While some researchers have suggested that distracting responses and tasks are potentially effective methods in controlling pain, clinical evidence showed that distracting responses and tasks cannot decrease patients’ vigilance to pain cues, especially in patients with a high level of pain catastrophising (Eccleston & Crombez, 1999; Goubert, Crombez, Eccleston, & Devulder, 2004). It has also been suggested that distraction results in more intensive pain after the termination of the distraction task (Goubert et al., 2004). Therefore, those patients who display more pain behaviours and have family caregivers who respond to such behaviours with more solicitous or distracting behaviours might perceive their pain to be worse.

In contrast, receiving negative responses might be interpreted by patients as a sign that family caregivers do not take the pain seriously and will not provide support (Raichle et al., 2011). In this case, it is possible that pain behaviours are not reinforced among these patients and the likelihood of observing a relationship between pain behaviours and pain intensity might be low. On the other hand, to obtain the needed support, these patients may express more pain behaviours. However, considering that patients with chronic pain are familiar with their family caregivers’ responses, it is more probable that these patients have already learned that their family caregivers will not provide the support that they need. In sum, we hypothesise that the link between pain behaviours and pain intensity is stronger if family caregivers express more solicitous or distracting responses. In contrast, we hypothesise that this link is weaker or non-existing if family caregivers express negative responses.

Family caregivers’ responses can be investigated based on different perspectives, i.e., patients’ perceptions of family caregivers’ responses and family caregivers’ own perceptions of their responses to the pain of the patient. However, previous studies on patient–family caregiver interactions in chronic pain contexts most often considered only patients’ perceptions of family caregivers’ responses or family caregivers’ perception of their own responses (e.g. Peterson & Palermo, 2004; Rosen et al., 2012; Simons, Claar, & Logan, 2008). These studies have neglected the fact that patients’ perceptions might be different from family caregivers’ perceptions. For example, a response that is considered by family caregivers as supportive might not be perceived as such by patients. While we cannot conclude whose report (patients vs. family caregivers) is more accurate without observing the actual responses, investigating both perspectives will provide a better understanding of the process (Pence, Cano, Thorn, & Ward, 2006). We followed previous studies’ recommendation (e.g. Claar, Guite, Kaczynski, & Logan, 2010; Peterson & Palermo, 2004) and included both patients’ and family caregivers’ perceptions of the variable of interest (i.e. family caregivers’ responses to pain) and will compare the findings.
In sum, the current study hypothesises that the patients who tend to catastrophise about pain show more pain behaviours. In turn, patients who express more pain behaviours are likely to perceive more intensive pain depending on the responses of their family caregivers. That is, patients who display more pain behaviours will perceive more intensive pain if family caregivers show more solicitous or distracting responses, and if family caregivers express fewer negative responses (i.e. based on patients’ perception of family caregivers’ responses to pain and based on family caregivers’ perception of their own responses to patients’ pain). Figure 1 shows the hypothetical moderated mediation model.

Method

Sample
The sample of participants consisted of 156 patients and family caregivers. Two patients and five family caregivers did not fully complete the questionnaires. Therefore, they were excluded from the analyses. The final sample for the current study consisted of 154 chronic pain patients, with an average age 45.66 years (SD = 13.18; Range 18–78 years old). The majority of the participants were women (77.9%, n = 120) and married (83.8%, n = 129); the remaining participants were single (11%, n = 17), widowed (3.9%, n = 6) or divorced (1.3%, n = 2). The main pain locations were lower limbs (32%), upper limbs (12.7%), and back (11.3%); 44% indicated that they experienced pain in more than one location. The final sample of family caregivers consisted of 151 participants, with an average age of 39.43 years (SD = 13.86; range 18–70 years old). About half the sample was female (n = 76, 50.3%) and the majority of the family caregivers were married (70.2%, n = 106).

Seventy-three dyads (48%) were couples; in 52 (34.2%) cases wives were patients. Forty-two dyads (27.7%) were mother and daughter; in 32 cases, (21.1%) mothers were patients. The rest of the participants were categorised as follows: mothers as patients and their sons as family caregivers (9.2%, n = 14), siblings (9.2%, n = 14), fathers as patients and their child as family caregivers (5.2%, n = 8; two were daughters and six were sons), sons as patients and their fathers as family caregivers (.7%, n = 1).
**Procedure**

The participants were recruited as part of a larger cross-sectional study on the interpersonal processes between patients with chronic pain and their family caregivers in relation to pain outcomes and well-being (e.g., Mohammadi, Dehghani, Khatibi, Sanderman, & Hagedoorn, 2015). From September 2012 until January 2013, patients with musculoskeletal chronic pain who were referred to the orthopaedic and physiotherapy centres of Atieh Hospital (Tehran, Iran) and their family caregivers were asked to participate in the study. The mental health center of the hospital provided ethical approval for the current study. Only the patients that were accompanied by their family caregivers were approached and invited to the study. Inclusion criteria for both patients and family caregivers were being older than 18 years of age and having sufficient literacy to complete the questionnaires. Furthermore, family caregivers had to be the main family caregivers of the patients who suffered from constant pain for more than 3 months. Exclusion criteria for both patients and family caregivers were having a serious mental illness, head injury and current drug and alcohol abuse. Furthermore, patients and family caregivers were excluded if the family caregiver had constant pain for more than 3 months or had any present acute pain.

The secretaries at the outpatient clinics identified potentially eligible patients and their family caregivers as soon as patients registered at the secretary desk. Then, the researcher approached the identified patients and family caregivers and provided them information about the study and assessed the inclusion and exclusion criteria. Dyads who provided informed consent were included into the study and asked to complete a battery of questionnaires. In one of the clinics, participants were also asked to perform an attentional bias task, which is reported elsewhere (Mohammadi et al., 2015). The researcher invited approximately 180 eligible dyads (i.e. patients and their family caregivers) to participate in the study. Of those, 156 dyads agreed to participate (The approximate response rate was 0.87). The main reasons for declining participation were lack of time, lack of interest and having severe pain.

**Measures**

*Pain intensity.* Chronic pain patients were asked to indicate their current pain intensity on a visual analogue scale (VAS). The VAS consisted of a 10-cm ungraded horizontal line anchored by two descriptive words at each end, indicating ‘no pain at all’ and ‘the maximum intensity of pain’. This scale has good test–retest reliability (Ferraz et al., 1990).

*Pain catastrophising.* Pain catastrophising was assessed with the Pain Catastrophising Scale (PCS; Sullivan et al., 1995). The PCS consisted of 13 items (e.g., ‘I feel I can’t stand it anymore.’ or ‘I keep thinking about how much it hurts.’). Each item is rated on a 5-point Likert-type scale (0 = not at all; 4 = all the time). The PCS has shown good reliability with a Cronbach’s alpha of 0.85 (Crombez, Eccleston, Baeyens, & Eelen, 1998), which is similar to the Cronbach’s alpha of 0.88 observed in this study. The reliability and validity of this measure have been previously investigated and confirmed in a sample of Iranian patients with chronic pain (Raeissadat, Sadeghi, & Montazeri, 2013). A higher average score indicates higher levels of catastrophising.
Pain behaviours. Pain behaviours were measured with the 17-item Pain Behaviour Checklist (PBCL; Kerns et al., 1991). Patients were asked to indicate how often they express each pain behaviour (e.g. ‘Talk about pain’, ‘Walk with limp’ and ‘Clench teeth’) when they are in pain on a 7-point Likert-scale (0 = never to 6 = very often). The reliability and stability estimates for the PBCL support the clinical and theoretical utility of this instrument (Kerns et al., 1991; Osman et al., 1995). The alpha coefficients among a group of chronic pain patients ranged from 0.63 to 0.85, in addition test–retest reliability coefficients ranged from 0.76 to 0.87 (Kerns et al., 1991). In addition, this measure was significantly related to measures of affective distress, depression, and facial and audible expressions, indicating its acceptable concurrent validity. In addition, the PBCL was significantly associated with observed pain behaviours (Kerns et al., 1991), which also supports the validity of this measure. A Confirmatory Factor Analysis (CFA) was performed to investigate the validity of the Persian version of this measure. The results of the CFA revealed that the model that was mentioned by Osman and colleagues (1995) fits the data in our sample ($\chi^2 = 214.09, p = 0.001; \text{CFI} = 0.88; \text{NFI} = 0.80, \text{RMSEA} = 0.07$). Also in the current study, the PBCL showed good internal consistency (Cronbach’s alpha = 0.85). In this study, higher average scores indicate higher pain behaviours.

Family caregivers’ responses to pain. To assess patients’ perceptions about family caregivers’ responses to pain, the ‘Significant Other Response’ section, which is a part of the West Haven-Yale Multidimensional Pain Inventory (WHYMPI; Kerns, Turk, & Rudy, 1985) was used. This section consists of 14 items: Solicitous responses (6 items; e.g. gets me to rest), Distracting responses (4 items; e.g. encourage me to work on a hobby), and Negative responses (4 items; e.g. ignores me). The reliability estimates for the Solicitous, Distracting, and Punishing subscales in the WHYMPI were 0.78, 0.78 and 0.84, respectively (Kerns et al., 1985). In addition, Mirzamani, Safari, Holisaz, and Sadidi (2007) have investigated the validity of this measure in a sample of Iranian patients with chronic pain and reported an acceptable validity for the Persian version of this measure. The Cronbach’s alphas for Solicitous, Distracting, and Punishing responses in the study conducted by Mirzamani et al. (2007) were as follows: 0.89, 0.84 and 0.84. In the current study, the Cronbach’s alphas were 0.80, 0.80 and 0.65, respectively.

Family caregivers were asked to fill out the significant other version of the West Haven-Yale Multidimensional Pain Inventory (WHYMPI-SO; Kerns & Rosenberg, 1995). The WHYMPI-SO is specifically designed for investigating family caregivers’ perception about how they respond to patients’ pain. The WHYMPI-SO includes the same subscales as the WHYMPI. However, in the WHYMPI-SO, one item in the negative subscale was modified (i.e. ‘ignores me’ in the WHYMPI is replaced with ‘leave the room’ in the WHYMPI-SO). In the WHYMPI-SO, the item ‘Reads to me’ has been omitted from the distracting subscale. Finally, in the WHYMPI-SO, four new items were added to the solicitous subscale, increasing the total number of items in this subscale to 10. In total, the WHYMPI-SO consists of 17 items. The alpha coefficients for the solicitous, distracting and negative subscales for WHYMPI-SO as reported by Kerns and Rosenberg (1995) were 0.75, 0.80 and 0.80, respectively. To investigate the validity of the Persian version of this measure, a confirmatory factor analysis (CFA) was performed. The results of the CFA showed that the specified model fits the data for WHIMPI-SO ($\chi^2 = 163.69, p = 0.001; \text{CFI} = 0.92; \text{NFI} = 0.79, \text{RMSEA} = 0.05$). In
addition, the Cronbach’s alphas of Solicitous, Distracting, and Negative subscales of the WHYMPI-SO in our study were 0.80, 0.77 and 0.55.

Patients were asked to indicate how often their family caregivers show each of the responses when they are in pain. Family caregivers were asked to report how often they show each of the responses when their family member is in pain. A seven-point Likert-scale (0 = never to 6 = very often) was used for indicating the frequency of each item for the WHYMPI and the WHYMPI-SO. The scores were averaged and a higher score indicates a higher frequency of the respective responses.

Statistical plan
To examine the associations between all the variables in the study, Pearson product-moment correlations were calculated. To test the hypotheses of the current study, the PROCESS computation tool (i.e. a SPSS macro) was used. The PROCESS tool can be used to examine mediation, moderation and a combination of mediation and moderation analyses (Hayes, 2013). To test the mediating effect of pain behaviours in the link between pain catastrophising (predictor variable) and pain intensity (dependent variable), we used model 4 in the PROCESS tool, which is for examining a simple mediation model. The mediation analysis provides information about several weights: weight $a$ shows the effect of pain catastrophising on pain behaviours, weight $b$ presents the effect of pain behaviours on pain intensity while controlling for pain catastrophising, weight $c$ represents the total effect of pain catastrophising on pain intensity, weight $c'$ provides information about the direct effect of pain catastrophising on pain intensity, and weight $a \times b$ shows the indirect effect of pain catastrophising on pain intensity through pain behaviours. Following the procedure described by Preacher and Hayes (2004), the bootstrap method (with 5000 bootstrap resamples) was conducted to examine the indirect effect for the mediation analysis.

Next, we performed six separate moderated mediation analyses, one for each type of family caregivers’ responses based on patients’ reports or family caregivers’ reports. For the moderated mediation analyses, we used model 14 in the PROCESS macro. The moderated mediation analyses aimed to examine whether the effect of pain catastrophising (predictor variable) on pain intensity (dependent variable), through patients’ pain behaviours (mediator), varied based on family caregivers’ responses (moderator). All the variables in the model, except for the dependent variable (i.e. pain intensity) were centred. For centring the variables, we used an option in PROCESS that mean-centred the variables in the model. The PROCESS computed the conditional indirect effects (i.e. when a moderator affects the size of an indirect effect; with 5000 bootstrap resamples). The information regarding conditional indirect effects were used to depict the regression slopes for relatively high (+1 SD) and low (−1 SD) pain behaviours.

Results
Correlation analyses
Table 1 presents the correlation coefficients between all the variables in the study. The analyses showed a significant correlation between pain catastrophising and pain intensity ($r = 0.37$) and between pain catastrophising and pain behaviours ($r = 0.57$). The correlation between pain behaviours and pain intensity was also significant ($r = 0.36$).
In addition, patients’ age was not correlated with any variable in the study. However, there was a significant difference ($t = -2.38, p = 0.02$) between men (mean = 40.1, $SD = 12.30$) and women (mean = 44.41, $SD = 9.17$) in reporting solicitous responses in the caregiver group. Therefore, in the moderated mediation analysis in which solicitous responses as perceived by caregivers were entered as moderator, sex was controlled for.

The correlations between patients’ perceptions of solicitous and distracting responses and caregivers’ perceptions of solicitous and distracting responses were significant (i.e. $r = 0.20$ and $r = 0.21$), but not very strong. However, the correlation between the patients’ perceptions of negative responses and caregivers’ perceptions of negative responses ($r = 0.09$) was not significant.

**Testing the mediating effect of patients’ pain behaviours**

The mediation analysis showed a significant effect of patients’ pain catastrophising on patients’ pain behaviours ($weight \ a: b = 0.72; SE = 0.08; t = 8.26; p = <0.001$). The effect of patients’ pain behaviours on their perception of pain intensity while controlling for pain catastrophising was also significant ($weight \ b: b = 5.94; SE = 2.47; t = 2.4; p = 0.017$). The total effect of pain catastrophising on pain intensity was significant ($weight \ c: b = 12.82; SE = 2.66; t = 4.81; p < 0.001$). The direct effect of pain catastrophising on pain intensity was also significant ($weight \ c': b = 8.50; SE = 3.17; t = 2.67; p = 0.008$). Then, the effect of pain behaviours as mediator was investigated. The results of the bootstrap test for pain behaviours as mediator was significant (effect = 4.31; 95% CI: 1.08–8.07), indicating that pain behaviours mediated the link between pain catastrophising and pain intensity or, in other words, the difference between weight $c$ and weight $c'$ is significant. In short, the results indicated that higher levels of pain catastrophising are associated with more pain behaviours, which in turn is associated with higher levels of pain intensity.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>$SD$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pain catastrophising</td>
<td>24.28</td>
<td>10.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. Pain intensity</td>
<td>48.95</td>
<td>28.71</td>
<td>.37**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Patients’ pain behaviours</td>
<td>35.67</td>
<td>17.84</td>
<td>.57**</td>
<td>.36**</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4. Patients’ perception of solicitous response</td>
<td>21.74</td>
<td>9.06</td>
<td>.07</td>
<td>-.10</td>
<td>.06</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>5. Patients’ perception of distracting response</td>
<td>11.81</td>
<td>6.56</td>
<td>.10</td>
<td>.08</td>
<td>.07</td>
<td>.61**</td>
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<tr>
<td>7. Caregivers’ solicitous response</td>
<td>42.21</td>
<td>11.06</td>
<td>-.003</td>
<td>-.02</td>
<td>.03</td>
<td>.20*</td>
<td>.08</td>
<td>-.03</td>
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<td>8. Caregivers’ distracting response</td>
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<td>4.73</td>
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<td>.02</td>
<td>.05</td>
<td>.20*</td>
<td>.21**</td>
<td>-.07</td>
<td>.60**</td>
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<tr>
<td>9. Caregivers’ negative responses</td>
<td>4.15</td>
<td>4.22</td>
<td>.11</td>
<td>-.03</td>
<td>.1</td>
<td>-.13</td>
<td>-.01</td>
<td>.09</td>
<td>-.19*</td>
<td>-.04</td>
</tr>
</tbody>
</table>

*p < 0.05; **p < 0.01.
The moderated mediation analyses based on patients’ perception of family caregivers’ responses

Table 2 presents the results of the moderated mediation analyses based on the patients’ perception. The reported bs are unstandardised regression coefficients. The results indicated that patients’ perceptions of family caregivers’ solicitous responses moderated the effect of pain behaviours on pain intensity (\(b = 0.026; \ SE = 0.012; \ p = 0.04\); see Figure 2). The results of the conditional indirect effects showed that the observed positive link was only significant if patients reported relatively high levels of family caregivers’ solicitous responses (effect = 0.49; 95% CI [0.23–0.77]). Pain behaviours were not associated with pain intensity, if patients reported relatively low levels of family caregivers’ solicitous responses (effect = 0.04; 95% CI [−0.29 to 0.44]). As well as solicitous responses, patients’ perceptions of family caregivers’ distracting responses significantly moderated the link between pain behaviours and pain intensity (\(b = 0.053; \ SE = 0.02; \ p = 0.002\); see Figure 3). Specifically, pain behaviours were positively associated with pain intensity only if patients reported relatively high levels of family caregivers’ distracting responses (effect = 0.58; 95% CI [0.31–0.89]), but not if patients reported relatively low levels of family caregivers’ distracting responses (effect = −0.06; 95% CI [−0.39 to 0.27]). Finally, patients’ perceptions of family caregivers’ negative responses did not moderate the association between pain intensity and pain behaviours (\(b = −0.05, \ SE = 0.03, p = 0.095\)).

The moderated mediation analyses based on family caregivers’ perception of their responses

Another series of moderated mediation analyses were conducted to examine whether family caregivers’ responses based on family caregivers’ reports moderated the effect

<table>
<thead>
<tr>
<th>Moderator</th>
<th>Coefficientd</th>
<th>se</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solicitous responses(^a)</td>
<td>Pain behaviours</td>
<td>.29</td>
<td>.14</td>
<td>1.97</td>
</tr>
<tr>
<td></td>
<td>Pain catastrophising (weight c’)</td>
<td>.79</td>
<td>.25</td>
<td>3.17</td>
</tr>
<tr>
<td></td>
<td>Solicitous responses</td>
<td>−.31</td>
<td>.24</td>
<td>−1.29</td>
</tr>
<tr>
<td></td>
<td>Pain behaviours × Solicitous responses</td>
<td>.026</td>
<td>.01</td>
<td>2.06</td>
</tr>
<tr>
<td>Distracting responses(^b)</td>
<td>Pain behaviours</td>
<td>.27</td>
<td>.14</td>
<td>1.91</td>
</tr>
<tr>
<td></td>
<td>Pain catastrophising (weight c’)</td>
<td>.76</td>
<td>.24</td>
<td>3.12</td>
</tr>
<tr>
<td></td>
<td>Distracting responses</td>
<td>.21</td>
<td>.33</td>
<td>.65</td>
</tr>
<tr>
<td></td>
<td>Pain behaviours × Distracting responses</td>
<td>.053</td>
<td>.02</td>
<td>3.13</td>
</tr>
<tr>
<td>Negative responses(^c)</td>
<td>Pain behaviours</td>
<td>.28</td>
<td>.14</td>
<td>1.87</td>
</tr>
<tr>
<td></td>
<td>Pain catastrophising (weight c’)</td>
<td>.68</td>
<td>.24</td>
<td>2.79</td>
</tr>
<tr>
<td></td>
<td>Negative responses</td>
<td>1.10</td>
<td>.57</td>
<td>1.90</td>
</tr>
<tr>
<td></td>
<td>Pain behaviours × Negative responses</td>
<td>−.05</td>
<td>.03</td>
<td>−1.67</td>
</tr>
</tbody>
</table>

\(^a\)Model summary: \(R = .45; \ F = 9.05; \ P = < .001.\)

\(^b\)Model summary: \(R = .47; \ F = 9.80; \ P = < .001.\)

\(^c\)Model summary: \(R = .43; \ F = 8.27; \ P = < .001.\)

\(^d\)The reported coefficients are unstandardised regression coefficients.
The results showed that only family caregivers’ solicitous responses significantly moderated the link between pain behaviours and pain intensity ($b = 0.02; SE = 0.01; p = 0.02$; see Figure 4; Sex was controlled in this analysis). Specifically, pain behaviours were positively associated with pain intensity if family caregivers reported relatively high levels of solicitous responses (effect = 0.51; 95% CI [$0.23–0.88$]) but not if they reported relatively low levels of solicitous responses (effect = −0.001; 95% CI [$−0.42–0.43$]). No significant moderating effects were observed for family caregivers’ distracting ($b = 2.19; SE = 1.41; p = 0.12$) and negative responses ($b = 1.91; SE = 2.22; p = .38$) based on family caregivers’ report of these responses.
Discussion

The current study showed that the link between pain catastrophising and pain intensity is partially mediated by patients’ pain behaviours. Furthermore, we found partial support for our hypothesis that the link between pain behaviours and pain intensity depends on family caregivers’ pain-related responses. More specifically, patients who showed more pain behaviours reported more intense levels of pain, but only if they indicated that their family caregivers showed relatively high levels of solicitous and distracting responses and if family caregivers reported that they expressed high levels of solicitous responses.
In line with the literature, the current study showed a positive association between pain catastrophising and pain intensity (e.g. Granot & Ferber, 2005; Severeijns et al., 2004). According to the communal coping model of pain (Sullivan et al., 2000), pain catastrophising is a coping strategy in which patients try to deal with pain within a social context. Other models of pain catastrophising such as the appraisal model suggest that pain catastrophisers believe that they face a serious threat which they cannot handle. Perceiving inability to handle the situation stimulates patients to express their distress and seek social support – intentionally or not – by showing pain behaviours (Severeijns et al., 2004). Despite the different perspectives, both models posit that pain catastrophising cognitions increase the probability of expressing pain behaviours. This assumption is confirmed by the current study and other studies (e.g. Gauthier, Thibault, & Sullivan, 2011; Thibault, Loisel, Durand, Catchlove, & Sullivan, 2008). In addition, the findings of the current study showed that pain behaviours mediate the relationship between pain catastrophising and pain intensity. That is, patients who catastrophised more about pain showed more pain behaviours, which in turn were related to reports of more intensive pain. Learning theories posit that, in the short-term, pain behaviours such as specific body postures may result in fast pain relief, or they may result in receiving significant others’ supportive responses (e.g. taking over the patients’ responsibilities). However, these positive consequences may reinforce pain behaviour and eventually result in patients’ disability and inactivity, and the experience of persistent and more intensive pain.

Expressing pain behaviours may elicit different family caregiver responses (Romano, Jensen, Schmaling, Hops, & Buchwald, 2009). For example, when family caregivers observe patients’ pain expressions and they show more solicitous and distracting responses, such as taking over the responsibilities of patients or encouraging patients to rest, it is more likely to note higher levels of disability, distress and pain in patients with chronic pain (Chambers, Craig, & Bennett, 2002; Claar, Simons, & Logan, 2008; Peterson & Palermo, 2004). Moreover, some family caregivers’ solicitous responses, such as asking the patient to rest, may convey the notion to the patients that their pain condition is serious. Especially for those patients who tend to catastrophise about pain, this notion can increase their attention to pain and body sensations, which makes them prone to interpret other body cues as pain and to perceive more intensive pain.

In addition, the current study manifested no association between pain behaviours and pain intensity in patients whose family caregivers showed few solicitous and few distracting responses. The responses of these family caregivers do not appear to reinforce patients’ pain behaviours, perhaps as argued, because these responses do not imply that patients are facing a threat. However, while this finding might imply that non-solicitous responses have advantages to solicitous ones, other potential disadvantages of non-solicitous responses should be taken into account. For example, patients with family caregivers who show few solicitous and few distracting responses may know that when they need help, their family caregivers will not be very responsive. This can result in patients’ helplessness and depression (Glombiewski, Hartwich-Tersek, & Rief, 2010).

Furthermore, the current study showed that family caregivers’ solicitous responses based on both patients’ and family caregivers’ perceptions moderated the association between pain behaviours and pain intensity. However, it was not the case for distracting responses, meaning that the link between pain behaviours and pain intensity was only moderated by patients’ perceptions of family caregivers’ distracting responses. It is likely that patients and their family caregivers have different perspectives about what they
considered as distracting responses. Therefore, it is important to investigate which responses are considered as distracting by both patients and family caregivers. To do so, using an observational setting might be important. For instance, patients and their family caregivers can be asked to watch the videotaped interactions between family caregivers and their family members in pain and label the behaviours that they are observing.

Knowing how patients and caregivers label different responses is very important especially when we consider our findings about the distracting responses. While some previous studies suggested that distraction might decrease the pain intensity (e.g. Koller & Goldman, 2012), the findings of this study do not support this assumption. However, the findings of this study are in line with other studies that suggest that distraction is not very effective in reducing vigilance to pain, especially in patients with higher levels of pain catastrophising (e.g. Eccleston & Crombez, 1999; Goubert et al., 2004). In addition, the type of the responses that we asked patients and their caregivers to report might not be considered by patients as distractive. Furthermore, it is also likely that over time some distractive responses might lose their function and only be considered as a type of caring and supportive responses. As indicated earlier, further clarification of the definition of each type of responses based on patients’ and their caregivers’ perspectives in their own culture.

In addition, differences between patients’ and family caregivers’ perceptions about specific behaviours may also explain the observed discrepancies between patients and family caregivers in other studies. For example, Peterson and Palermo (2004) indicated that patients’ perceptions of caregivers’ supportive responses were not related to patients’ disability, while family caregivers’ perceptions of supportive responses predicted patients’ disability, suggesting that patients’ and/or family caregivers’ characteristics do influence the way that they perceive family caregivers’ responses. In sum, while our findings concerning solicitous responses are consistent, regardless of whether we used patient or family caregiver reports of responses, the findings for distracting responses need to be interpreted with caution since they may be due to common method variance. Moreover, it must be mentioned that the correlations between patients’ perception of caregivers’ responses and caregivers’ report of their own responses in general were low. As Bolger and colleagues (Bolger & Amarel, 2007; Bolger, Zuckerman, & Kessler, 2000) explained, some supportive responses might be invisible because patients are not aware of them or they might be delivered in a way that patients do not consider them as supportive. Therefore, patients may not be able to report some caregivers’ solicitous and distracting responses. Clinicians need to take patients’ and caregivers’ differences into account and try to help patients’ and their caregivers’ to understand the meaning of each other’s behaviours and responses. Future studies need to investigate the reasons behind these differences.

The current study has several strengths, including a large sample of patients with chronic pain and the examination of the perspective of both patients and their family caregivers on family caregivers’ responses. In addition, applying moderated mediated analyses aided us to investigate the role of mediator and moderator variables simultaneously. However, this study also has several limitations. First, the internal consistency of the family caregivers’ negative responses subscale was low for the patients’ version (Cronbach’s alpha = 0.65) as well as the family caregivers’ version (Cronbach’s alpha = 0.55). The low reliability reduces statistical power. In addition, the low alphas for negative responses may result from cultural differences between the original sample
that was used to develop this subscale and the current sample. Hence, it is important to consider measures that can provide a better picture of family caregivers’ negative responses based on their own culture. Therefore, the results of the analyses in which these subscales were used should be interpreted cautiously. Second, the sample of this study included three main categories: spouses, parent–child and siblings, and each category had several subcategories (e.g. female vs. male patient in couples). Due to the small sample size in each subcategory, we did not conduct the analyses separately. It should be also mentioned that our sample differed from other samples that are mostly reported in caregiving studies. In most previous studies, spouses or parents were considered as family caregivers, but we recruited any family member that was considered as the main family caregiver, resulting in several categories of family caregivers. While this might be only the case for our population, it might also suggest that family caregivers could be any member of the family and recruiting only spouses or parents as family caregivers might not provide a complete picture of family caregiver-patient interactions. Third, to assess pain behaviours and family caregivers’ responses we used patients’ and family caregivers’ self-reports. While self-report methods are efficient and practical for obtaining data, these methods have disadvantages such as recall biases and errors in self-observations. These disadvantages encourage researchers to use observational methods in which one can study the actual behaviours of participants and not what they say that they do. Applying observational methods should be considered in future studies. Furthermore, we do not have any information on the caregiving duties of family caregivers and the intensity of the interactions between family caregivers and patients. Studying how family caregivers’ duties affect family caregivers’ pain-related responses is an interesting avenue for future studies. Moreover, only the patients who were accompanied by a family caregiver were invited in this study and we do not have information on the patients who entered the clinic alone. Finally, the cross-sectional nature of this study limits our ability to investigate the causality. By applying a longitudinal research or daily diary study we would be able to obtain a better picture of the sequential relationship between pain catastrophising and pain intensity.

Despite these limitations, the results of the current study add to our understanding of the role of behavioural and social factors in the association between pain catastrophising and pain intensity. As it was hypothesised, the patients who catastrophise more about pain showed more pain behaviours. In turn, patients with pain who expressed more pain behaviours perceived more intensive pain depending on the responses of their family caregivers. That is, patients exhibiting more pain behaviours reported higher pain intensity only if their family caregivers showed highly solicitous or highly distracting responses. The findings of the current study provide the ground for researchers to consider the possible differences between patients and their family caregivers in their perceptions of caregivers’ responses. It is important to understand the reasons behind patients’ and caregivers’ low agreement in reporting of specific behaviours. In addition, these findings highlight the role of family caregivers in patients’ well-being and the findings are in line with those that indicate that not all supportive responses may cause positive outcomes (e.g. Bolger & Amarel, 2007; Bolger et al., 2000; Girme, Overall, & Simpson, 2013). It is important that researchers study the effect of other responses on patients’ well-being and clinicians try to equip caregivers to provide more effective and beneficial responses.
Disclosure statement
No potential conflict of interest was reported by the authors.

References


