CATASTROPHIZING AND TREATMENT OUTCOME: DIFFERENTIAL IMPACT ON RESPONSE TO PLACEBO AND ACTIVE TREATMENT OUTCOME

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Abstract

Background: The primary objective of this study was to examine the differential impact of catastrophic thinking on response to placebo and active treatment in the context of a clinical trial for the treatment of neuropathic pain. Secondary objectives included examination of specific dimensions of catastrophic thinking that influence response to placebo and active treatment.

Methods: A sample of 46 patients (26 men, 20 women) with neuropathic pain were randomly assigned to a placebo (n = 24) or treatment (amitriptyline + ketamine) condition (n = 22). All patients completed the Pain Catastrophizing Scale prior to treatment.

Results: There were no significant differences between placebo and active treatment on pain reduction. In the placebo condition, high scores on the PCS were associated with greater pain reduction (r = 0.42, P < 0.05), while in the treatment condition, higher PCS scores were associated with less pain reduction (r = -0.51, P < 0.01). Additional analyses revealed that individuals in the active treatment condition reported slightly more side effects than individuals in the placebo condition, and that catastrophizing was significantly correlated with the report of side effects (r = 0.29, P < 0.05).

Conclusion: Catastrophizing appears to have a differential impact on treatment response to placebo and active treatment. Given that side effects are more likely with active treatments than placebos, high levels of catastrophizing might impact negatively on active treatment effects but not necessarily on placebo effects. Discussion addresses how pain catastrophizing may contribute to null findings in clinical trials of interventions for pain disorders. Copyright © 2008 British Society of Experimental & Clinical Hypnosis. Published by John Wiley & Sons, Ltd.

Key words: neuropathic pain, pain catastrophizing, placebo, side effects, topical analgesics

Introduction

The work of John Chaves was instrumental in launching a line of enquiry that would ultimately dominate the science of the psychology of pain (Chaves and Brown, 1978,
In 1978, Chaves and Brown presented a paper describing the results of a study examining psychological influences on pain outcomes following a stressful dental procedure (Chaves and Brown, 1978). In the latter study, Chaves and Brown identified a subgroup of individuals who experienced alarmist or catastrophic thoughts during the dental procedure. Their findings revealed that individuals who 'catastrophized' also experienced the dental procedure as significantly more stressful than individuals who did not catastrophize.

Since the early work of Chaves and Brown, pain catastrophizing has emerged as the most robust psychological predictor of pain outcomes (Sullivan, Rodgers and Kirsch, 2001; Campbell, Clauw and Keefe, 2003; Edwards, Bingham, Bathon, and Haythornthwaite, 2006). Pain catastrophizing is currently defined as a multidimensional construct comprising elements of rumination, magnification and helplessness (Sullivan et al., 2001). To date, several hundred investigations have revealed that pain catastrophizing is associated with a variety of adverse pain outcomes including heightened pain and emotional distress, heightened pain behaviour, increased analgesic intake, longer periods of hospitalization and greater functional disability (Jacobsen and Butler, 1996; Keefe, Lefebvre, Egert, Affleck, Sullivan and Caldwell, 2000; Bishop and Warr, 2003; Devoulyte and Sullivan, 2003; Pavlin, Sullivan, Freund, and Roesen, 2005; Sullivan, Ward, Tripp, French, Adams and Stanish, 2005; Edwards et al., 2006; Edwards, Smith, Kudel, and Haythornthwaite, 2006; Seminowicz and Davis, 2006; Citero, Levenson, McClish, Bobojerg, Cole, Dahman et al., 2007). Prospective studies have shown that high levels of catastrophizing predict problematic recovery trajectories following injury or illness (Pincus, Burton, Vogel, and Field, 2002; Linton, 2005; Pavlin et al., 2005). In recent writings, pain catastrophizing has been discussed as a psychological risk factor for the development of chronic pain and disability (Sullivan, Thorn, Haythornthwaite, Keefe, Martin and Bradley, 2001; Sullivan, Thorn, Rodgers, and Ward, 2004; Sullivan, Feuerstein, Gatchel, Linton, and Pransky, 2005; Gauthier, Sullivan, Adams, Stanish, and Thibault, 2006).

A number of recent studies have reported that pre-treatment levels of catastrophizing might predict poorer response to pharmacological interventions for pain. Haythornthwaite, Clark, Pappagallo and Raja (2003) reported the findings of a study assessing the efficacy of an opioid medication for post-herpetic neuralgia. Analyses revealed that initial pain catastrophizing scores predicted higher post-treatment pain ratings, even when controlling for baseline pain. In an experimental study investigating psychological factors related to pain perception and analgesia, Fillingim, Hastie, Ness, Glover, Campbell and Staud (2005) found that catastrophizing was associated with poor overall analgesic responses to intravenous pentazocine, but only in men.

In this paper, we report the results of a secondary analysis of data from a clinical trial of topical analgesics for neuropathic pain. Consistent with previous research, we expected that high pre-treatment scores on a measure of pain catastrophizing would be associated with poor treatment response. We further explored the relation between catastrophizing and poor treatment response by examining the contribution of the different dimensions of catastrophizing (e.g. rumination, magnification and helplessness) to treatment outcome.

Although catastrophizing was expected to interfere with treatment response, there was a basis for predicting that it might actually enhance the placebo response. For example, a number of studies have reported data suggesting that depression/anxiety symptoms might be associated with enhanced placebo response (Turner, Deyo, Loesser, Von Korff, and Fordyce, 1994; Shapiro and Shapiro, 1997; Wasan, Kapchuk, Davar, and Jamison, 2006). In a recent study, Wasan et al. (2006) examined the relation between...
emotional distress symptoms and placebo response in patients receiving treatment for chronic low back pain. Findings revealed that patients with few emotional distress symptoms showed 7% pain reduction in the placebo condition while patients with high levels of emotional distress showed a 23% reduction in pain in the placebo condition. Given that measures of emotional distress correlate highly with measures of catastrophizing, it is possible that catastrophizing might also be associated with enhanced placebo response.

The role of expectancies and desire for relief have been discussed as factors that might account for the placebo potentiating effects of emotional distress (Wasan et al., 2006). Wasan et al. (2006) suggest that the desire for relief might be greater in individuals with high distress states, thus increasing the probability that they will respond to placebo. This explanation however does not provide a compelling account of the negative impact of emotional distress (or catastrophizing) on response to active treatment. The desire for relief should be the same whether the patient receives placebo or active treatment.

It is possible that side effects might play a role in whether catastrophizing will augment or interfere with response to treatment. Side effects are typically more likely to be experienced in response to an active treatment as opposed to a placebo (Stone, Kerr, Jacobson, Conboy and Kaptchuk, 2004). If the negative impact of catastrophizing on treatment outcome is partly due to alarmist interpretations of novel sensations or side effects, it is possible that catastrophizing might impact negatively on active treatment, but not impact negatively on placebo responding.

The data for the present study were drawn from a double blind placebo controlled trial examining the effectiveness of topical analgesics for the relief of neuropathic pain (Lynch, Clark, Sawynok and Sullivan, 2005a). The original trial showed no significant effects of active treatment compared to placebo (Lynch et al., 2005a). The primary objectives of this study were to examine the differential impact of catastrophic thinking on response to placebo and active treatment and to explore whether level of catastrophizing might have played a role in obscuring potential treatment effects. The role of side effects in the relation between catastrophizing and treatment response was also explored. Finally, the different dimensions of catastrophizing associated with the reporting of side effects were examined.

Method

Participants

A sample of 46 patients (26 men, 20 women) with neuropathic pain were randomly assigned to a placebo (n = 24) or treatment (amitriptyline + ketamine) condition (n = 22). Participants were recruited from three hospital outpatient pain management units in eastern Canada. A detailed list of inclusion and exclusion criteria is presented in Lynch et al. (Lynch et al., 2005a). Participants included in the trial had diagnoses of diabetic neuropathy (n = 12), post herpetic neuralgia (n = 9) or post-surgical/traumatic neuropathy (n = 25). The mean age of the sample was 53.4 years (range = 25 to 84 years). The mean duration of pain was 69.0 months (range = 3 to 264 months).

Procedure

In the original double blind clinical trial, participants were randomly assigned to one of four treatment groups (placebo, ketamine, amitriptyline, amitriptyline + ketamine). The amitriptyline+ketamine preparation was the main target of the clinical trial with the
amitriptyline and ketamine conditions included as controls. For the purposes of the present study, only data from the placebo and amitriptyline+ketamine conditions are presented. The pattern of findings is unchanged when all treatment conditions are included.

Treatment preparations consisted of topical creams, containing 1) placebo (vehicle only), and 2) combination 2% amitriptyline/1% ketamine. The vehicle consisted of a moisturizing cream-like base. Preparations were identical in consistency, colour and volume. Participants were asked to apply 4 ml of cream to the site of maximum pain three times per day for three weeks. A measure of pain catastrophizing was completed the week prior to treatment, and a measure of pain was completed the week prior to treatment, and again at the end of the three-week trial.

Measures

Pain Severity

The McGill Pain Questionnaire (MPQ; Melzack, 1975) was used to assess current pain severity. On this measure, participants are asked to endorse adjectives that best describe their current pain experience. The Pain Rating Index (PRI) is a weighted sum of all adjectives endorsed, and is considered one of the more reliable and valid indices of an individual's pain experience (Turk, Rudy and Salovey, 1985). In addition to a total score, the MPQ yields subscale scores for affective and sensory pain. Participants completed the MPQ prior to treatment, and at the end of the three-week trial. Indices of treatment response were derived by subtracting post-treatment MPQ total and subscale scores from pre-treatment scores. Higher values reflect greater reduction in pain.

Pain Catastrophizing

The Pain Catastrophizing Scale (PCS) consists of 13 items describing different thoughts and feelings that individuals may experience when they are in pain (Sullivan, Bishop and Pivik, 1995). On this measure, subjects are asked to rate the frequency with which they experience different catastrophic thoughts and feelings when they are in pain on a 5-point scale with the endpoints (0) not at all and (4) all the time. The reliability and validity of the PCS has been well established (Osman, Barrios, Kopper, Hauptmann, Jones and O’Neill, 2000; Sullivan et al., 1995; Van Damme, Crombez, Bijttebier, Goubert and Van Hoodenhove, 2002). The PCS yields a total score and subscale scores for rumination, magnification and helplessness.

Side Effects

At weekly clinic visits, participants were asked to report any side effects they might have experienced. Examination of the participants' reports of side effects revealed that reports varied in the degree to which they were could be plausibly linked to the topical creams (e.g. skin tingling vs tinnitus). Only peripheral side effects were expected (e.g. tingling, irritation) since blood assays revealed that there was no systemic absorption of the topical preparations (Lynch et al., 2005a; Lynch, Clark, Sawynok and Sullivan, 2005b). For the purposes of the present study, no attempt was made to address the plausibility of side effects being directly attributable to the creams. The total number of side effects reported through the course of the three-week trial was used in the analyses.

Data Analytic approach

Tests of mean differences were used to compare placebo and active treatment conditions on pain reduction and side effects. Pearson correlations were conducted to assess the relation between PCS and pain reduction scores and side effects. The role of catastroph-
Catastrophizing as a moderator of placebo and treatment response was examined using a two-way between-groups analysis of variance.

**Results**

**Sample characteristics**
There were no significant differences between placebo and treatment conditions on sex distribution, $\chi^2 = 0.73$, ns, or distribution of diagnoses, $\chi^2 = 0.93$, ns. There were no significant differences between placebo and treatment conditions on age, t (44) = 0.61, ns, duration of pain, t (44) = 0.40, ns, MPQ-PRI scores, t (44) = 1.4, ns, or PCS scores, t (44) = 0.28, ns. These data are presented in Table 1.

**Treatment response**
An independent samples t-test was used to assess group differences in changes in MPQ-PRI scores through the course of treatment. The results of this analysis revealed that the placebo ($M = 5.2$, $SD = 9.2$) and treatment ($M = 3.8$, $SD = 8.8$) conditions did not differ significant in the magnitude of reduction in pain scores, t (44) = 0.51, ns.

**Catastrophizing and response to placebo and treatment conditions**
Pearson correlations were computed between PCS total and subscale scores, and reduction in pain scores. Correlations were computed separately for patients in the placebo and treatment conditions. As shown in Table 2, catastrophizing appeared to enhance placebo responding, but interfered with response to active treatment. In the placebo condition, PCS total scores were positively correlated with change in MPQ-PRI scores, $r = 0.43$, $p < 0.05$, and in the treatment condition, PCS total scores were negatively correlated with change in MPQ-PRI scores, $r = -0.51$, $p < 0.01$. Of the three different PCS subscales, only the magnification subscale correlated significantly with change in MPQ-PRI scores.

**Catastrophizing as a moderator of treatment response**
A two-way (Level of Catastrophizing (high vs low) X Group (Placebo vs Treatment) between-groups analysis of variance was conducted on MPQ-PRI change scores. For this analysis, high and low catastrophizing groups were created by dividing the sample

<table>
<thead>
<tr>
<th>Table 1. Sample characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td>men/women</td>
</tr>
<tr>
<td>Diagnosis phn/pstn/dn</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Duration of pain (months)</td>
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<tr>
<td>MPQ-PRI</td>
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<tr>
<td>PCS</td>
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</table>

*Note: phn = post-herpetic neuropathy; pstn = post-traumatic neuropathy; dn = diabetic neuropathy. Values in parentheses are standard deviations. MPQ-PRI = McGill Pain Questionnaire – Pain Rating Index; PCS = Pain Catastrophizing Scale.*

Table 2. Correlation between Catastrophizing and Response to Placebo and Treatment Conditions

<table>
<thead>
<tr>
<th></th>
<th>PCStot</th>
<th>Rumin</th>
<th>Magni</th>
<th>Helps</th>
<th>chMPQ-PRI</th>
<th>chMPQ-Aff</th>
<th>chMPQ-Sens</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCStot</td>
<td>0.92**</td>
<td>0.71**</td>
<td>0.97**</td>
<td>0.43*</td>
<td>0.43*</td>
<td>0.36</td>
<td></td>
</tr>
<tr>
<td>Rumin</td>
<td>0.87**</td>
<td>0.47*</td>
<td>0.88**</td>
<td>0.32</td>
<td>0.28</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>Magni</td>
<td>0.80**</td>
<td>0.53**</td>
<td>0.58**</td>
<td>0.45*</td>
<td>0.44*</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>Helps</td>
<td>0.95**</td>
<td>0.80**</td>
<td>0.64**</td>
<td>0.39</td>
<td>0.44*</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>chMPQ-PRI</td>
<td>-0.51*</td>
<td>-0.41</td>
<td>-0.55**</td>
<td>-0.42</td>
<td>0.75**</td>
<td>0.95**</td>
<td></td>
</tr>
<tr>
<td>chMPQ-Aff</td>
<td>-0.27</td>
<td>-0.24</td>
<td>-0.44*</td>
<td>-0.13</td>
<td>0.77**</td>
<td>0.63**</td>
<td></td>
</tr>
<tr>
<td>chMPQ-Sens</td>
<td>-0.53**</td>
<td>-0.42</td>
<td>-0.53**</td>
<td>-0.47*</td>
<td>0.97**</td>
<td>0.62**</td>
<td></td>
</tr>
</tbody>
</table>

Note: Values above the diagonal are for the placebo condition, values below the diagonal are for the treatment condition. PCStot = Pain Catastrophizing Scale - total score; Rumin = PCS Rumination subscale; Magni = PCS Magnification subscale; Helps = PCS Helplessness subscale; chMPQ-PRI = change in McGill Pain Questionnaire – Pain Rating Index = chMPQ-Aff = change in MPQ Affective subscale; chMPQ-Sens = change in MPQ Sensory subscale. * p < .05; ** p < .01.

Figure 1. Pain reduction as a function of treatment condition and level of catastrophizing. Note: Values on the vertical axis refer to changes in MPQ-PRI scores between pre- and post-treatment assessments. Higher values reflect greater reduction in pain.

along the median of PCS scores (median = 24). The results of this analysis are presented in Figure 1. The analysis yielded only a significant Level of Catastrophizing X Group interaction, F (1, 42) = 8.8, p < .001. The main effects for Level of Catastrophizing and Group were not significant.

Tests of simple effects revealed that in the placebo condition, patients in the high catastrophizer group showed greater, albeit not significant, reductions in pain than patients in the low catastrophizer group, t (22) = −1.4, p = 0.15. In the treatment condition, patients in the low catastrophizer group showed significantly greater reductions in pain than patients in the high catastrophizer group, t (20) = 2.8, p < .01.

The role of side effects
As noted earlier, it is possible that catastrophizers propensity to appraise novel sensations or side effects in an alarmist manner, might explain why catastrophizing interferes with
response to active treatment. The results of an independent samples t-test, revealed that although patients in the treatment condition reported more side effects (M = 0.63, SD = 1.1) than patients in the placebo condition (M = 0.33, SD = 0.44), differences did not attain statistical significance, t (44) = -1.2, p = 0.23. Pearson correlations were computed to examine the relation between catastrophizing and the reporting of side effects. As shown in Table 3, catastrophizing was associated with a propensity to report more side effects. Of the three PCS subscales, only the magnification subscale was significantly correlated with number of side effects. Although catastrophizing was correlated with number of side effects, it is not clear that side effects can account for the differential relation between catastrophizing and change in pain in the placebo and treatment conditions. When side effects were used as a covariate, the interaction between Level of Catastrophizing and Group remained significant, p < 0.01.

Discussion

Issues related to placebo responding have been the focus of considerable recent discussion (Kirsch, 2000, 2004; Price, Finniss and Benedetti, 2008; Whalley, Hyland and Kirsch, 2008). While some have argued that the magnitude of placebo response in clinical pain trials is often negligible, others have held that placebo response accounts for most of the variance in treatment effects of analgesic agents (Hrobjartsson and Gotzsche, 2001; Vase, Riley and Price, 2002). Given that variations in the magnitude of placebo response can have dramatic impact on the outcomes of clinical trials, research on the determinants of placebo responding is clearly needed (Kirsch, 2000; Price et al., 2008).

The results of this study are consistent with previous research suggesting that catastrophizing interferes with the effectiveness of analgesics (Haythornthwaite et al., 2003; Fillingim et al., 2005). For patients in the treatment condition, higher PCS scores were associated with less pain reduction through the course of the three-week trial. Previous research has also shown that depressive symptoms interfere with the efficacy of analgesics (Wasan, Davar and Jamison, 2005). The mechanisms by which psychological factors interfere with response to analgesics remain unclear. It has been suggested that individuals high in negative affect or catastrophizing might produce endogenous nocebo-like responses due to their negative cognitions (Fillingim et al., 2005). It has also been suggested that catastrophizing or depression might compromise processes involved in descending inhibition of pain (Edwards and Fillingim, 2001).

The results of the present study suggest additional processes by which catastrophizing might impact negatively on treatment response. The magnification subscale of the PCS was most strongly associated with poor treatment response, and the magnification subscale was also correlated with side effects. Chaves and Brown (1987) discussed

Table 3. The relation between catastrophizing and reporting of side effects

<table>
<thead>
<tr>
<th></th>
<th>PCSStot</th>
<th>Rumin</th>
<th>Magni</th>
<th>Helps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Side effects</td>
<td>0.29*</td>
<td>0.10</td>
<td>0.40**</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Note: PCSStot = Pain Catastrophizing Scale - total score; Rumin = PCS Rumination subscale; Magni = PCS Magnification subscale; Helps = PCS Helplessness subscale. * p < 0.05; ** p < 0.01.
magnification as central to the construct of catastrophizing. The authors characterized catastrophizing as a tendency to amplify the threat value associated with pain symptoms, and to worry about potential serious consequences to pain eliciting situations. Consistent with this view, there is research to suggest that catastrophizers interpret even innocuous stimuli or symptoms as threatening (Crombez, Eccleston, Baeyens and Eelen, 1998; Devoulyte and Sullivan, 2003; Van Damme, Crombez, Eccleston and Goubert, 2004). It is possible that catastrophizers might misinterpret novel treatment-related sensations or side effects in an alarmist manner, leading to their conclusion that treatment is ineffective. Once catastrophizers conclude that treatment is ineffective, they may preferentially process somatic information that is consistent with that conclusion.

The results of the present study extend previous research in showing that high levels of catastrophizing were associated with enhanced placebo responding. A relation between catastrophizing and placebo responding has not been reported previously in the literature. However, there is a theoretical basis for suspecting a link between catastrophizing and response to placebo. The results of a number of investigations suggest that expectancies for pain may be one of the factors through which catastrophizing influences pain experience (Sullivan et al., 2001b; Sullivan, Rodgers and Kirsch, 2001a; Van Damme, Crombez and Eccleston, 2002). It is possible that expectancy-based processes might be partially responsible for this effect. Placebo responses have also been discussed in relation to expectancies (Kirsch, 1985, 1997; Pollo, Amanzio, Arslanian, Casadio, Maggi and Benedetti, 2001). If pain catastrophizing is an expectancy-based phenomenon, and placebo responding is also an expectancy-based phenomenon, then at least under certain conditions, individuals who catastrophize might be particularly susceptible to placebo responding.

The lower frequency and/or severity of side effects resulting from placebo might also play a role in the placebo enhancing effects of catastrophizing. It can be assumed that patients with chronic neuropathic pain enter treatment with a high desire for pain relief. Initial response, whether due to an active treatment agent or placebo likely provides the basis for patients’ inferences about the efficacy of the treatment. Even for the patient who wants to believe that the treatment will be effective, the presence of side effects would constitute disconfirming evidence. The absence of side effects would essentially not disconfirm the patients’ beliefs about treatment effectiveness. The role of side effects in accounting for the differential impact of catastrophizing on placebo and treatment response remains speculative given that controlling for side effects does not eliminate this relation.

The use of a topical cream as a vehicle for an analgesic agent also adds another dimension to mechanisms of pain relief. Painful areas of the body are often protected through guarding behaviour or activity avoidance (Vlaeyen and Linton, 2000). Fear is considered to be the driving force of bodily protection, as well as a contributor to the intensity of pain experience (Leeuw, Goossens, Linton, Crombez, Boersma and Vlaeyen, 2007). The application of a topical cream to a painful site requires that the patient repeatedly ‘approach’ the area that has previously been avoided. The cream application might constitute a form of exposure that might reduce the intensity of pain-related fear, and in turn, reduce the intensity of pain. Given the research showing significant relations between pain-related fears and catastrophizing, it is possible that the impact of exposure would have been greatest for individuals who entered treatment with the highest levels of catastrophizing. While this account might explain why catastrophizing was associated with heightened placebo responding, it is not clear why similar processes would not have also led to pain reductions in the treatment condition.
The results of the present study suggest that pain catastrophizing may be associated with a 'placebo potentiating' effect. In the placebo condition, PCS scores accounted for 29% of the variance in pain reduction (large effect size). It is interesting to note that effect sizes for analgesics used in neuropathic conditions are typically in the medium range. In the present study, the magnitude of the relation between catastrophizing and pain reduction in the placebo condition was sufficient to obscure a treatment effect. It is not unreasonable to speculate that failure to take into account patients' catastrophizing scores might have contributed to many null outcomes in previous clinical trials.

The results of a number of recent investigations suggest that the relation between catastrophizing and pain-related outcomes may vary as a function of social-contextual variables (Price et al., 2008). For example, the 'exposure' element of a topical application might have favoured the emergence of a strong relation between catastrophizing and placebo response. It is also known that conditioning effects play a significant role in placebo responding (Kirsch, 2004). To the extent that the topical treatment would be viewed as 'novel' by patients, the treatment might not have been influenced by previous treatment failures. The novelty of the treatment might have potentiated the overall placebo effect in the study.

Some degree of caution must be exercised in the interpretation of the findings reported in this paper. First, the findings are a secondary analysis of a null clinical trial. Although there was an empirical and theoretical basis for positing a relation between catastrophizing and poor treatment response, the basis for positing a relation between catastrophizing and enhanced placebo responding was more speculative. Furthermore, since a no treatment condition was not included, it is not possible to discern with any degree of confidence whether observed relations were specific to placebo-related processes or the result of the natural fluctuations in symptoms of a chronic pain condition (Polio et al., 2001; Price et al., 2008). Finally, confidence in the reliability of the findings awaits replication with a larger sample size.

In spite of these limitations, the findings of this study join a growing literature showing that catastrophizing interferes with the effectiveness of analgesics. The findings also suggest that, at least under certain conditions, catastrophizing might enhance response to placebo. The combination of these effects is likely to have significant implications for the detection of treatment effects for the relief of pain. This study supports the importance of including psychological measures in clinical trials, not only as important outcome measures, but also as determinants of treatment response (Turk, Dworkin, Allen, Bellamy, Brandenburg and Carr, 2003).

Acknowledgements

This trial was funded by an unrestricted grant from EpiCept Corporation.

References


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