Measuring Emotional Intelligence Enhances the Psychological Evaluation of Chronic Pain.

Eva M. Doherty[1], Rosemary Walsh[2], Leanne Andrews[3], Susan McPherson.[3]

Running head: Emotional intelligence scores are associated with pain intensity ratings.

Corresponding author: Dr Eva M. Doherty, National Surgical Training Centre, Royal College of Surgeons in Ireland, 123, St Stephens Green, Dublin 2. Ireland. Tel: +353 1 402 2216. Email: edoherty@rcsi.ie.

[1] National Surgical Training Centre, Royal College of Surgeons in Ireland, 123, St Stephens Green, Dublin 2, Ireland.

[2] Pain Management Unit, St. Vincent's University Hospital, Elm Park, Dublin 4, Ireland.

[3] School of Health and Human Sciences, University of Essex, Wivenhoe Park, Colchester, CO4 3SQ. United Kingdom.

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ABSTRACT

The assessment of emotional factors, in addition to other psychosocial factors, has been recommended as a means of identifying individuals with chronic pain who may not respond to certain pain treatments. Systematic reviews of the evidence regarding the prediction of responsiveness to a treatment called the Spinal Cord Stimulator have yielded inconclusive results. Emotional intelligence is a term which refers to the ability to identify and manage emotions in oneself and others and has been shown to be inversely associated with emotional distress and acute pain. This study aims to investigate the relationship between emotional intelligence, chronic pain and the more established psychosocial factors usually used for spinal cord stimulator evaluations by clinical psychologists in medical settings. A sample of 112 patients with chronic pain on an acute hospital waiting list for Spinal Cord Stimulator procedures in a pain medicine service were recruited. Psychological measures were completed including: a novel measure of emotional intelligence; usual measures of emotional distress and catastrophizing; and a numerical rating scale designed to assess pain intensity, pain-related distress and interference. As predicted, findings revealed significant associations between most of the measures analysed and current pain intensity. When entered into a simultaneous regression analysis, emotional intelligence scores remained the only significant predictor of current pain intensity. There are potential clinical, ethical and organizational implications of emotional intelligence processes partially predicting pain in patients on a waiting list for a medical procedure. These

results may offer new insight, understanding and evaluation targets for clinical psychologists in the field of pain management.

Keywords

Emotional intelligence; emotional distress; catastrophizing; current pain intensity

Introduction

Psychological factors such as emotional distress and catastrophizing have been identified as common responses to chronic pain and are associated with sub-optimal responses to certain pain treatments (Gatchel et al., 2007; Keefe et al., 2002; Lumley et al., 2011; Pincus et al., 2008). Treatment efficacy reviews indicate that psychological factors should be included in pre-treatment patient assessments, particularly when a Spinal Cord Stimulator (SCS), an implantable device used for intractable chronic pain conditions is being considered (Block et al., 2001; Cruccu et al., 2007; Dworkin et al., 2005). Vlayen and Linton's fear-avoidance model offers an explanatory theory as to why persistent pain can be so emotionally distressing. Pain sensations are interpreted as highly threatening (pain catastrophizing), and so can trigger an evolving cascade of: fear of additional pain, pain-related fear of movement, and fear of re-injury. This pattern leads in turn to a syndrome of avoidance behaviors, hypervigilance to bodily sensations and ultimately to pain disability, disuse and depression (Vlayen & Linton 2000). The fear avoidance model has also been used to describe how negative emotional states operate as important precursors in the development of chronic pain following injury. (Leeuw et al., 2007; Linton et al., 2000; Pincus et al., 2006; Vlaeyen & Linton 2000).

The *Örebro Model of Behavioral Emotion Regulation for Pain* (Linton & Bergbom 2011), a further development of the fear-avoidance model proposes that emotion regulation is a central component of the response to a mood or pain flare-up rather than merely a

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precursor. The model offers a framework which describes the relationship between emotion regulation ability, negative emotions and catastrophizing in the response to pain. It also proposes that successful emotion regulation results in coping while unsuccessful emotion regulation results in spiraling depression and pain-related disability.

The assessment of emotional distress has been recommended to guide the selection of patients for pain treatments such as a SCS, (Block et al., 2013; Campbell et al., 2013; Cruccu et al., 2007; Simpson et al., 2009; Williams et al., 2011). However despite such recommendations, two systematic reviews failed to draw firm conclusions regarding the psychological indicators of emotional distress which best predicted responsiveness to SCS; emotions such as anxiety and depression were found to be both inversely and positively related to outcome (Celestin et al., 2009; Sparkes et al., 2010). The Minnesota Multiphasic Personality Inventory (MMPI) has been widely used to predict responsiveness to SCS, but with mixed results. It has been suggested that the emotional distress profiles of the MMPI are actually reflections of the emotional impact of the chronic pain rather than an indicator of pre-existing personality traits or emotion regulation ability (Fishbain et al., 2006; Fishbain et al., 2009). A measure of emotion regulation ability would be a useful addition to psychological assessment batteries commonly used in pain management units.

Emotional intelligence and chronic pain

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Emotional intelligence refers to the capacity to monitor and manage emotions and, has been shown to predict both physical and psychological well-being (Martins et al., 2010; Schutte et al., 2007). There are a number of competing theories and definitions of emotional intelligence, and it is a controversial area within psychology (Matthews et al., 2012). Emotional intelligence has been defined as a trait (Petrides & Furnham 2003), a competency, (Bar-On 1997) and an ability (Salovey & Mayer 1990). Trait theorists define emotional intelligence as "a constellation of emotion-related self-perceptions and dispositions" (Petrides & Furnham 2003, p40). The competency theory states that emotional intelligence is "an array of non-cognitive capabilities, competencies and skills" (Bar-On 1997, p. 14). The ability definition describes emotional intelligence as: "the ability to monitor one's own and others' feelings and emotions, to discriminate among them, and to use this information to guide one's thinking and actions" (Salovey & Mayer 1990, p189). Self-report measures are used to assess trait and competency emotional intelligence while performance-based measures are used to assess ability emotional intelligence as an ability. Self-report measures require the individual to report on their emotionally and socially intelligent behaviors, while performance measures require the individual to complete emotion tasks such as identifying emotions in facial expressions and pictures and selecting the best strategies to manage emotions. (Mayer et al., 2008).

Trait emotional intelligence as measured by self-report was demonstrated to be inversely related to pain ratings in an online study of 200 individuals with chronic pain recruited from pain support group and pain management clinic websites (Wright &

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Schutte 2014). Self-report measures have been criticised, however, because of the problems resulting from shared method variance and the potential for faking (Mayer et al., 2008; Roberts et al., 2010; Zeidner et al., 2008). Therefore a performance measure of emotional intelligence, assessing ability emotional intelligence rather than self-rated emotional intelligence may be more suitable for pre-treatment selection for SCS.

Ability emotional intelligence has been associated with the experience of acute pain. For instance, negative affectivity (i.e., the experience of negative emotions) was found to mediate the relationship between ability emotional intelligence and the experience of acute pain in a pain laboratory experiment (Ruiz-Aranda at el., 2011). Affect regulation and the ability to manage negative affect has also been identified as an important predictor of pain (Connolly et al., 2007). Individual differences in the ability to manage negative affect which is related to psychological well-being have been identified (Barger et al., 2010; Hemenover et al., 2008).

In sum, existing evidence therefore supports the suggestion that negative emotions mediate the relationship between emotional intelligence and pain. However the use of an emotional intelligence measure as a means of identifying individuals with low emotional intelligence and high reported pain has not been explored. The first step in such an investigative process is to establish the relationship between emotional intelligence and pain ratings. If such a link is identified, the next step is to establish whether the measurement of emotional intelligence provides a useful addition to the

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existing battery of psychological tests used in the assessment of pain. If ability emotional intelligence proves to be a better predictor of pain ratings than emotional distress, psychological interventions designed to enhance emotional intelligence may improve emotional management skills and thereby lessen the experience of pain and perhaps even responsiveness to SCS.

This study sought to investigate whether the assessment of ability emotional intelligence might have a useful role to play in the psychological assessment of severe chronic pain patients' suitability for treatment for a SCS. It hypothesized that the ability emotional intelligence scores of a sample of patients on a waiting list for a SCS, would be significantly associated with their ratings of chronic pain intensity on a numerical rating scale (NRS). In addition, it hypothesized that ability emotional intelligence would be a better predictor of current pain intensity than other measures of psychological status such as emotional distress and catastrophizing.

Methods

Participants and procedure

Participants were recruited from a SCS waiting list in a multidisciplinary pain management unit in a university teaching hospital. Patients were placed on this waiting list by the pain management team as they were considered not to have responded adequately to other treatments such as pharmacotherapy, pain injections/nerve blocks or cognitive–behavioral interventions. Thus, this sample of patients with chronic pain represented the most severe end of the spectrum of chronic

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pain conditions. Patients were sent a letter explaining the study with an invitation to attend an assessment on a date suitable for them. Three-hour appointments were made for 8 participants at a time to attend together as a group and consisted of completion of the battery followed by a pre-procedural education session. All participants provided verbal and written consent. The results of the emotional intelligence assessment were not reported to the pain management team during the research period. Ethical approval for the study was granted by the institution's research ethics board.

One hundred and fourteen patients from a waiting list of 139 agreed to participate in the study. Two of these were excluded because they did not speak or understand English leaving a total participant sample of 112. This sample size is considered to provide adequate power for the detection of small to medium effects using correlational and multiple regression analyses (Cohen 1988). A majority of participants were female (63.4%), and, the mean age of the sample was 49.29 years (range: 20 - 75 years, *SD* = 12.29). All participants reported Ireland as their country of birth and English as their first language. For the purposes of this study, the measures of emotional distress, pain intensity and emotional intelligence are reported. Participants' responses on the paper version of the ability emotional intelligence measure (i.e., MSCEIT V2.0) were entered manually by the researcher (ED) onto the test distributor's website (www.MHSasseessments) for scoring.

Measures

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The measures described were part of a psychological assessment battery administered by the clinical psychologist to patients being assessed for suitability for SCS. The measure of emotional intelligence was added to the battery for the purposes of the study. Only total scores rather than item raw scores from the routine measures were made available to the researcher so reliability calculations were only possible for the measure of emotional intelligence.

Pain

Pain Rating Scale (British Pain Society). The Pain Rating Scale, published in 2006 by the British Pain Society (BPS), is a multidimensional measure of pain and consists of six items. The items are scored individually rather than being added together to form a composite score (BPS, 2006). Five of the items are presented as numerical rating scales (NRS) with values ranging from *No pain = 0 to Extreme pain =10.* Respondents are asked to evaluate the following pain dimensions: 1) Intensity of current pain [referred to hereafter as "BPS Pain Intense Now"]; 2) Intensity of current levels of distress caused by the pain; 3) Intensity of pain in the previous week; 4) Intensity of distress caused by pain in the previous week; 5) Degree of interference with everyday activities caused by pain; and 6) Percentage rating of perceived pain relief from treatment. Because pain fluctuates over time, a high index of test-retest reliability is not appropriate as it would indicate insensitivity to change in pain rather than reliability across time. The scale has been well validated (Coghill et al., 2003).

Emotional distress

194 *The Beck Depression Inventory-Fast Screen* (BDI-FS) is a seven-item screening measure
195 of depressive symptomatology designed for use with patients in medical settings (Beck
196 et al., 2000). Each item contains four response options that can be allocated a score of
197 0, 1, 2 or 3 and the total BDI-FS score is the sum of item values checked by the
198 respondent. Total raw scores range from 0 – 21, with scores over 4 indicating the risk
199 of the presence of clinical depression. Internal consistency described in the manual
200 was found to be excellent (Cronbach's alpha = .92). However, for the present sample,
201 Cronbach's alpha for the BDI-FS could not be calculated because only total scores were
202 made available to the researcher. Validity of the BDI-FS has been demonstrated with a
203 chronic pain population (Poole et al., 2009). Each of the seven items contains a
204 heading, followed by four statements with corresponding scores, (0 to 3) indicated. So
205 for example, the heading of the first item is "Sadness," followed by the lowest possible
206 response, *I do not feel sad* = 0 to the highest possible response, *I am so sad or unhappy*
207 *that I can't stand it* = 3. Another example is item 6, "Self-Criticalness," followed by the
208 lowest possible response, *I don't criticise or blame myself more than usual* = 0 *to the*
209 highest possible response, I *blame myself for everything bad that happens* = 3.

210 *The short-form version of the Depression Anxiety Stress scales* (DASS-21) consists of 21-
211 items, which measure emotional distress on a 4-point Likert scale (Lovibond &
212 Lovibond 1995). It yields estimates of anxiety, depression, stress and a composite
213 emotional distress score. The authors have shown that the measure has demonstrated
214 good reliability, (Cronbach's alpha: total score = .93, depression = .88, anxiety = .82,
215 stress = .90). Cronbach's alphas for the DASS-21 could not be calculated for the present

sample because only total scores were available to the researcher. The DASS-21 has been shown to have a factor structure that is consistent with the allocation of items to the three subscales and to exhibit high convergent validity with other measures of anxiety and depression (Henry & Crawford 2005). The composite score can range from 0 to 63, and scores on each subscale range from 0 to 21. Higher scores indicate greater distress. Respondents rate each item on a response scale ranging from *Did not apply to me at all* = 0 to *Applied to me very much, or most of the time* = 3. Examples of items are: from the Depression subscale, "I couldn't seem to experience any positive feeling at all;" from the Anxiety subscale, "I was aware of dryness in my mouth," and from the Stress subscale, "I found myself getting agitated".

The *Irritability Questionnaire* is comprised of two scales; one for the respondent, and the other for the carer/spouse (Craig et al., 2008). The carer/spouse part of the questionnaire was not used in the study. The self-respondent scale consists of 21 items that describe anger responses and require participants to indicate both the frequency and intensity of anger-related experiences on a 4-point scale. The statements cover aspects of mood, attention, memory, appraisal, behaviors and consequences. Higher scores indicate a greater degree of irritability. The authors have demonstrated excellent internal consistency, (Cronbach's alpha, global score = .90) and good split-half reliability, (Cronbach's alpha, global score = .78), and it has been validated against other measures of anger (Craig et al., 2008). Cronbach's alphas for the Irritability

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questionnaire could not be calculated because the researcher only had access to total scores. Statistical norms for this measure are not yet available. Possible total score ranges from 0 to 126. The response scale format for the frequency subscale ranges from *Never* = 0 to *Most of the time* = 3; for the intensity subscale, the response format ranges from *Not at all* = 0 to *Very much so* = 3. Two examples of the items are: ”I lose my temper and shout and snap at others,"*,* and *”*I feel as if people make my life difficult on purpose.”

The *Pain Catastrophizing Scale* (PCS) is a 13-item instrument that asks participants to indicate on a 5-point scale the degree to which they have experienced each of 13 thoughts or feelings about pain (Sullivan et al., 1995). The responses scale ranges from *Not at all* = 0 to *All the time*. = 4. The scale measures three dimensions of catastrophizing: Rumination (”I can’t stop thinking about how much it hurts”); Magnification *(”*I worry that something serious may happen*”*); and Helplessness *(”*It’s awful and I feel that it overwhelms me”). It has been shown to have good internal consistency (Cronbach’s alphas; total PCS = .87, Rumination = .87, Magnification = .66, Helplessness = .78). For the present sample, Cronbach’s alphas for the PCS could not be calculated because only total scores were available to the researcher. The lowest possible score for each subscale = 0 and the highest possible score for each of the subscales is as follows; Rumination = 16; Magnification = 12 and Helplessness = 24. The PCS total score is calculated by summing responses to all 13 items and the possible

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score ranges from 0-52. A total score above 30 is considered to be clinically relevant as a psychosocial risk factor for a chronic pain population (Sullivan et al., 1995).

Emotional intelligence

The Mayer-Salovey-Caruso Emotional Intelligence Test Version 2 (MSCEIT V2.0) is a 141 item questionnaire that assesses the ability to perceive, use, understand and manage emotions (Mayer et al., 2002). Based on scenarios typical of everyday life, the MSCEIT V2.0 measures how well people perform tasks and solve emotional problems rather than having them provide their own subjective assessment of their emotional skills.

The measure is completed either online or by paper and pencil and responses can be entered online for scoring (www.mhsassessments.com). Different scoring options are available which allows for comparison with norms according to expert/consensus and age and gender. Expert refers to a method of scoring whereby the response to the test items is compared to the views of 21 emotion experts (Mayer et al 2003). Expert, age and gender were selected on the website to score the responses in the present study. Scores are computed as empirical percentiles with an average of 100 and a standard deviation of 15. Scores are interpreted along a continuum of increasing emotional ability as follows; 69 or less: consider development; 70-89: consider improvement; 90-99: low average; 100-109: high average; 110-119: competent; 120-129: strength and 130+: significant strength. As shown in Figure 1, the measure yields a number of scores: Total Emotional Intelligence score; four branch scores (*Perceive, Use*, *Understand* and *Manage* emotions); and two composite scores, the Experiential

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Emotional Intelligence score which represents the sum of the *Perceive* and *Use* scores, and the Strategic Emotional Intelligence score which represents the sum of the *Understand* and *Manage* scores. An example of a *Perceive* branch item is a picture of a face with an accompanying instruction, *"*How much is each feeling below expressed by this face?" Five response scales naming different emotions are provided each with a numbered 5 point Likert scale, (1-5). The verbal anchors for the five different emotion scales are: n*o happiness* to *extreme happiness*, *no fear* to *extreme fear*, *no surprise* to *extreme surprise*, *no disgust* to *extreme disgust* and *no excitement* to *extreme excitement*. An example of a "Use" branch item is: "A man was feeling rested and then felt admiration. What happened in between?" Five response options follow: a) *while resting, the man solved an important problem at work*, b) *the man heard a story about a sports hero who set a new world record*, c) *his friend called to say he had just purchased a new sports car at a great price*, d) *a package arrived with a gift from his mother*, e) *his doctor called to say his check-up indicated he was healthy*. An example of an *Understand* branch item is, "Imagine you are feeling closed, dark and numb. How much of that feeling is like each of the following?" Three different emotions are listed each with a 5 point scale ranging from, *Not Alike* = 1 to *Very Much Alike* = 5. The three emotions are *Sad*, *Content* and *Calm*. An example of a *Manage* branch item is "A sad surprise leads to-------" .Five response options are listed and the respondent is requested to choose the best one: a) *disappointment*, b) *amazement*, c) *anger*, d) *fear*, e) *regret.*

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Estimates of reliability were calculated on a sample of 5000 respondents from the U.S. and other countries including the United Kingdom. Internal consistency reliability coefficients were calculated to be = .91 for the full scale score with subscale values ranging from .74 to .89 (Mayer et al., 2002). In the present study, the Cronbach's alpha for the full-scale score was .88 with subscale values ranging from .70 - .88.

The validity of the branches in the measure has been questioned and hierarchical factor analysis has demonstrated only partial support (Fan et al., 2010; Farrelly & Austin 2007; Keele & Bell 2008; Roberts et al., 2006; Rode et al., 2008; Rossen et al., 2008), and only the results of statistical analyses using the total and composite area scores will be reported.

Data analyses

SPSS, version 18 was used for statistical analysis. Some of the data from the variables measured were not normally distributed and so mean values (*M*) with standard deviations (*SD*), ranges and medians (*Mdn*) and inter-quartile ranges (*IQR*) are presented for all variables. Associations between emotional intelligence, emotional distress and pain were examined using Spearman's rho correlations. In order to investigate whether emotional intelligence is a predictor of the pain experience, the "BPS Pain Intense Now" was chosen from the outset as the dependent variable for the regression analysis as it was considered to be the best indicator of the current pain experience independent of considerations of distress or influenced by recall. The remaining five BPS scores require a consideration of pain and distress last week and

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also a report on pain relief experienced to date and thus are likely to be associated with emotional distress and potentially with emotional intelligence for these reasons alone. Mean scores of those variables found to be significantly correlated with "BPS Pain Intense Now" (i.e., pain intensity) were entered into a simultaneous regression analysis, and only total scores of the observations were included.

Results

The percentage of missing values was between 11%-14% which is less than the recommended threshold for concern (Collins et al., 2011). Numbers of cases are given in tables for all variables and pairwise deletion was used to manage missing values and maximise sample size.

Sample characteristics

All participants reported having a chronic pain condition characterized by persistent pain. The median duration of pain in the sample population was 8.0 years (*IQR*: 4.0 – 13.0 years). Eighty-four participants (74.3%) were taking medication for their pain and 84 (74.3%) described their pain as constant. The most common pain location was the back (58.2%) with/without involvement of limb/s. Accident trauma (e.g., a road traffic accident or an injury at work) was reported as the main cause of the onset of chronic pain (35.4%).

Correlations among BPS Pain Scores

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All six BPS scores were associated with each other with the exception of the "BPS Pain Relief" scores which were only associated with the "BPS Pain Intense Now". Strong correlations were found between the "BPS Pain Distress last week" and the "BPS Pain Intense Last Week" and the "BPS Pain Distress Now" scores. Moderate correlations between the "BPS Pain Interference" score and the remaining four BPS scores with the exception of the "BPS Pain relief "score were also found.

Emotional distress and pain

Table 1 presents the summary statistics for the emotional intelligence, emotional distress and pain variables. High levels of emotional distress and pain were reported by most participants. Scores on the BDI-FS indicated that 57 participants obtained a score above the threshold suggestive of severe depression. Scores on the DASS-21 were indicative of general emotional distress in the sample. According to the available normative data, the samples' median total DASS-21 score was at the 91st percentile (Crawford et al., 2009). Twenty four participants obtained scores indicating moderate to severe depression, 26 obtained scores indicating moderate to severe anxiety and 10 obtained scores indicating moderate to severe stress. The median total score on the PCS was below the threshold of 30 and so were not indicative of an abnormal degree of catastrophizing (Sullivan et al., 1995). Total Emotional Intelligence scores ranged from 54.59 (consider developing) to 133.05 (significant strength). The mean score on the Experiential Area scale was within the low average range and the mean score on the Strategic Area scale was within the consider improvement range.

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362 *Correlates of pain*

363 As anticipated apriori, the BPS pain scores which concerned distress and recall were
364 more strongly associated with many of the emotional distress scores. Small to
365 moderate positive correlations were found between "BPS Pain Intense Last Week",
366 "BPS Pain Distress Now", "BPS Pain Distress Last Week" and "BPS Interference" scores
367 and scores on the DASS-21 Total, DASS-21 Depression, DASS-21 Anxiety scores. These
368 same four BPS scores were also moderately and positively associated with the PCS
369 Rumination, Magnification and Helplessness scores.

370 Smaller correlations were found between the "BPS Pain Intense Now" scores and Total
371 DASS-21 scores, DASS-21 Depression and DASS-21 Anxiety subscale scores and also
372 with the Total PCS scores and with the PCS Rumination, Magnification and
373 Helplessness subscale scores. The "BPS Pain Intense Now", the "BPS Pain Intense Last
374 Week" and the "BPS Pain Distress Last week" scores were negatively and significantly
375 correlated with the Total Emotional Intelligence scores, and with the Strategic Area
376 scores.

377 The finding that the BPS scores which included a consideration of distress and recall of
378 pain were more strongly associated with the measures of emotional distress than the
379 "BPS Pain Intense Now" scores supported the apriori decision to focus the analysis of
380 regression on the "BPS Pain Intense Now" variable as the best measure of pain
381 intensity independent of an influence of distress and recall.

382 *Correlates of emotional intelligence*

Small but significant correlations were found between Total Emotional Intelligence scores and scores on measures of emotional distress, irritability and pain, such that lower emotional intelligence scores were associated with higher levels of emotional distress, irritability and pain. Total Emotional Intelligence scores and Strategic Area scores were associated with just one of the PCS subscale scores, Magnification, indicating that participants with higher emotional intelligence scores were likely to catastrophize less about their pain (Table 2).

Emotional intelligence and pain intensity

Total scores for the variables found to be significantly correlated with "BPS Pain Intense Now" (i.e. emotional distress, catastrophizing and emotional intelligence) were entered into a simultaneous regression analysis (Table 3). The combination of variables used to predict "BPS Pain Intense Now" was found to be statistically significant, F (3, 86) = 4.73, p <.01. The Total Emotional Intelligence score was the only variable that significantly predicted "BPS Pain Intense Now" such that the higher the Total Emotional Intelligence score, the lower the "BPS Pain Intense Now" score. Neither the emotional distress nor the catastrophizing scores contributed uniquely to "BPS Pain Intense Now". The adjusted R^2 value was .11. This indicates that 11% of the variance in

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403 "BPS Pain Intense Now" is explained by the present study model, constituting a small
404 effect size (Cohen 1988).

405 **Discussion**

406 A wide range of emotional intelligence scores was evident in the current sample. The
407 mean Total Emotional Intelligence score was in the "consider improvement" category,
408 which indicated that many of the participants had lower than average emotional
409 intelligence scores, and a reduced ability to manage emotional responses (Mayer et al.,
410 2002). The distribution of the MSCEIT V2.0 scales was normal with the exception of the
411 Strategic Area scale.

412 As identified in previous studies, individuals low on emotional intelligence reported
413 high levels of emotional distress, irritability and catastrophizing, which indicated poor
414 psychological well-being. Total emotional intelligence, emotional distress, and
415 catastrophizing together were found to predict pain and accounted for 11% of the
416 variance in "BPS Pain Intense Now". Of the three psychological variables entered into
417 the regression analysis, (i.e. emotional distress, catastrophizing and emotional
418 intelligence), emotional intelligence was the only predictor of "BPS Pain Intense Now".
419 While the study only demonstrated a small effect size, it is likely that the relationship
420 between emotional intelligence and pain is an important finding given the many
421 psychological factors contributing to patients' pain reports as demonstrated in two
422 systematic reviews (Celestin et al., 2009; Sparkes et al., 2010). Emotional intelligence
423 may be a useful construct and means of identifying individuals who experience

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difficulties with the emotional management of pain and thus would benefit from a psychological intervention to enhance their emotional intelligence and influence the associated pain experience. The use of an ability emotional intelligence measure offers clinical psychologists and pain management teams an alternative to existing measures of emotional status. This study suggests that further exploration is warranted of the value of a measure of ability emotional intelligence, such as the MSCEIT V2.0 as a potential addition to psychological assessment batteries for use with patients with severe chronic pain.

Study limitations

The main limitation of the current study is the fact that the data were collected cross-sectionally and therefore causal arguments cannot be made. Although a significant association between ability emotional intelligence and reported pain intensity is identified, longitudinal studies are required to establish if ability emotional intelligence can predict the experience of pain over time and responsiveness to pain treatments, in particular a SCS.

In addition, the percentage of missing values which averaged between 11 to 14% for some of the variables, and reduced the sample size available for some of the statistical analyses is another limitation although the percentage missing was less than the maximum acceptable level of 25% (Collins et al., 2001). Missing values resulted from participants not responding, or inadvertently skipping items in the booklet. It was difficult to ensure that all measures were completed while supervising up to eight

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participants at a time during the psycho-education assessment sessions. It was recognised that participants were likely to be experiencing considerable pain and discomfort and that missing values had to be accepted as an inevitable consequence of conducting research in the healthcare setting of a chronic pain management clinic.

A further possible limitation stems from the use of the MSCEIT V2.0 as a measure of ability emotional intelligence and of emotion regulation ability. Controversy continues to surround the use of the MSCEIT V2.0 as the measure of emotional intelligence; other theories of emotional intelligence are competing for recognition as the theory of choice (Bracket et al., 2011). Nevertheless, it remains the best available measure of ability emotional intelligence (Côté 2014; Gardner & Qualter 2011; MacCann 2010; Mayer et al., 2008).

The use of only one item from the British Pain Society scale (i.e., "BPS Pain Intense Now") could be considered a limitation. The authors set out to investigate the relationship between emotional intelligence and pain intensity and so chose this variable from the outset. It would be very interesting to evaluate the relationship between the remaining BPS scales and emotional intelligence. Perhaps emotional intelligence is also related to the recall of pain and to pain distress. Another possible limitation is the fact that the test authors do not supply estimates of reliability. The British Pain Society contends that because pain ratings fluctuate from day to day, moment to moment, that reliability is not a valid criterion.

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Depression, as measured by the DASS-21 was associated with pain intensity, but the BDI-FS measure of depression was not associated with pain intensity. This finding indicates that, for this sample the DASS-21 was more sensitive to pain intensity ratings. The measure of irritability, another indicator of emotional distress, also was not associated with pain in this sample. However the focus of this study was not to investigate the validity of the measures contained in the test battery, but rather to investigate the possibility that emotional intelligence has a role to play in the pain experience. The findings demonstrate that lower scores on emotional intelligence are positively linked to reported pain intensity. Yet, the variation among measures in their association with a measure of the pain experience indicates that future research should examine differences among measures of depression and irritability with regard to their relative sensitivity to patients' reports of pain. It would be difficult to undertake that task with the present dataset given that the researchers had access only to total scores. A further limitation relates to generalizability, as the findings may be only applicable to individuals with severe pain or those awaiting spinal cord stimulator procedures.

Strengths and Implications

To the best of our knowledge, this is the first study to demonstrate that ability emotional intelligence, in addition to other psychosocial variables such as emotional distress and catastrophizing is a predictor of pain intensity reports in patients with

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severe chronic pain. Catastrophizing and emotional distress have been previously identified as important psychosocial factors in the pain experience and this study extends the current literature on these factors and pain by demonstrating that ability emotional intelligence may make a greater contribution to the variance in pain than emotional distress and catastrophizing. Therefore, emotional intelligence may potentially be a more important focus in the assessment of the pain experience than measures of emotional distress or personality. Individuals with low levels of emotional intelligence could be identified and referred for psychological intervention designed to enhance emotional awareness and the management of emotions such as sadness, anxiety and anger. The efficacy of such interventions could then be evaluated by assessing improvements in the ability to regulate emotions and reductions in pain intensity. Evidence for the benefits of such intervention programmes already exist (Bowlin & Baer 2012; Kranz et al 2010; Lumley et al 2011; Morley 2011). The use of a measure of ability emotional intelligence may further help to operationalise these benefits in emotional awareness and management in order to better manage the pain experience. Enhanced emotional intelligence may prove to be a useful predictor of responsiveness to pain treatments such as a SCS.

Conclusion

This study indicates that a measure of ability emotional intelligence could be considered for routine inclusion in assessment batteries used for the psychological

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evaluation of patients with chronic pain. A prospective study of participants that report varied levels of pain intensity is recommended to further investigate the relationship between the pain experience and emotional intelligence, emotional distress and catastrophizing.

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Figure 1**.** *The Mayer-Salovey-Caruso Emotional Intelligence Test Version Two* (MSCEIT V2.0)

Table 1 Descriptive statistics for all measures of pain, emotional distress, and emotional intelligence assessed while participants were on a waiting list for SCS implantation

Measure	Mean (*SD*)	Sample Range	Median	Inter-quartile Ranges	N
BPS					
Pain Intense Now[a]	7.05 (2.09)	1.50-10	7.00	6.00-8.50	108
Pain Intense Last Week[a]	7.55 (1.96)	1-10	8.00	6.00-9.00	108
Pain Distress Now[a]	7.11 (2.44)	1-10	8.00	5.63-9.00	108
Pain Distress Last Week[a]	7.35 (2.18)	1-10	7.50	6.00-9.00	107
Pain Interference [a]	8.07 (1.87)	1-10	8.50	7.00-9.50	108
Pain Relief (if applicable) [a]	35.83% (28.79%)	0-100%	30.00%	10.00%-60.00%	96
BDI-FS[a]	5.57 (4.08)	0-19	5	3-8	104
DASS-21					
Depression [a]	8.68 (6.03)	0-21	8	3-13.25	98
Anxiety [a]	6.42 (5.16)	0-21	5	2-10	98
Stress [a]	9.42 (5.67)	0-26	9	4.75-14	98
Total [a]	24.64 (15.60)	0-61	22	12-35.25	98
Irritability	56.25 (19.90)	9-98	55	41-73	107
PCS					
Rumination [a]	10.48 (7.23)	0-66	10	7-13	97
Magnification [a]	5.04 (3.44)	0-15	4	3-7	97
Helplessness	12.79 (6.07)	0-24	13	9-16.75	100
Total [a]	27.34 (12.60)	1-53	28	19-33	99
MSCEIT V2.0					
Perceive	95.11(14.06)	66.62-132.71	93.71	85.11-104.19	107
Use	96.99 (17.84)	59.90-135.40	97.71	82.41-107.66	107
Understand	81.39 (12.83)	45.65-117.79	80.27	73.62-89.96	105
Manage	87.76 (19.46)	25.15-145.91	84.59	76.07-98.31	107
Experiential	94.43 (14.89)	62.47-130.46	93.52	84.34-105.48	107
Strategic [a]	81.70 (14.48)	36.99-126.17	80.96	71.59-90.08	105
Total	84.38 (14.45)	54.59-133.05	83.89	74.44-94.17	105

Note. [a] not normally distributed; BPS = British Pain Society Rating Scale); BDI-FS = Beck Depression-Inventory FastScreen; DASS-21 = Depression Anxiety Stress Scale; PCS = Pain Catastrophizing Scale; MSCEIT V2.0 = Mayer-Salovey-Caruso Emotional Intelligence Test Version 2.

742 Table 2 Correlations between pain, emotional distress and emotional intelligence scores

	1.BPS Pain Intense Now	2.BPS Pain Intense Last Week	3.BPS Pain Distress Now	4.BPS Pain Distress Last Week	5.BPS Pain Interfe-rence	6.BPS % Pain Relief	7.BDI-FS	8.DASS-21 Total	9.DASS -21 Depre-ssion	10.DASS -21 Anxiety	11.DASS -21 Stress	12.Irrita-bility	13.PCS Total	14.PCS Rumin-ation	15.PCS Magni-fication	16.PCS Helpless-ness	17.EI Total	18.EI Exper-iential	19.EI Strat-egic
1	…																		
2	.61***	…																	
3	.71***	.62***	…																
4	.55***	.78***	.82***	…															
5	.43***	.59***	.51***	.58***	…														
6	-.22*	-.04	-.19	-.18	-.06	…													
7	.02	.07	.20*	.25**	.38***	-.11	…												
8	.21*	.30**	.27**	.39***	.41***	-.02	.62**	…											
9	.17*	.25**	.30**	.42***	.43***	-.07	.66**	.94**	…										
10	.23*	.30*	.22*	.31**	.39***	.05	.48**	.89**	.78**	…									
11	.15	.15	.25*	.18	.30**	-.10	.54**	.91**	.78**	.72**	…								
12	.06	.19	.19	.28**	.30**	-.03	.54**	.63**	.55**	.58**	.60**	…							
13	.25**	.29**	.45***	.49***	.44***	-.15	.58**	.56**	.55**	.51**	.44**	.52**	…						
14	.25**	.34***	.44***	.52***	.40***	-.28***	.49**	.52**	.48**	.43**	.45**	.48**	.88**	…					
15	.21*	.14	.31**	.32**	.35***	-.13	.43**	.54**	.50**	.54**	.44**	.51**	.85**	.73**	…				
16	.20*	.31*	.43***	.47***	.45***	-.08	.53**	.50**	.52**	-.45**	.37**	.43**	-.90**	.69**	.68*	…			
17	-.32***	-.34***	-.19	-.29**	-.13	-.22*	.01	-.32***	-.30**	-.32**	-.27**	-.18*	-.14	-.10	-.24*	-.08	…		
18	-.15	-.20	-.07	-.16	-.09	-.14	.07	-.23**	-.19	-.23*	-.22*	-.08	-.02	-.05	-.17	.04	.74**	…	
19	-.34**	-.27**	-.23*	-.25**	-.08	-.24*	-.02	-.27**	-.26*	-.29**	-.20	-.20*	-.02	-.11	-.23*	-.13	.83**	.29**	…

743 *Note*. (N = 96) *$p < .05$, **$p < .01$, ***$p < .001$; BPS = British Pain Society Rating Scale; BDI-FS = Beck Depression Inventory-FastScreen; DASS-21 =
744 Depression Anxiety Stress Scale; PCS = Pain Catastrophizing Scale; EI = MSCEIT V2.0; Mayer-Salovey-Caruso Emotional Intelligence Test Version 2.

Table 3 Regression analysis predicting pain

Variables entered	R^2 *(adj)*	*F*	*B*	*β*	*t*
EI			.04	.29**	2.74
DASS-21			.00	.00	.00
PCS			.03	.21	1.74
Total equation	.11	4.73**			

Note. n = 87;*p < .05, **p< .01; EI = Emotional Intelligence (MSCEIT V2.0 = Mayer-Salovey-Caruso Emotional Intelligence Test Version 2); DASS-21 = Depression Anxiety Stress Scale; PCS = Pain Catastrophizing Scale.

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