Scandinavian Journal of Pain xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Scandinavian Journal of Pain

journal homepage: www.ScandinavianJournalPain.com

Original experimental

The buffering role of positive affect on the association between pain intensity and pain related outcomes

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HIGHLIGHTS

- Positive affect moderated the association between pain and depression.
- Positive affect moderated the association between pain and negative affect.
- Interventions increasing positive affect may benefit chronic pain patients.

ARTICLE INFO

Article history:
Received 8 June 2016
Received in revised form 6 September 2016
Accepted 8 September 2016
Available online xxx

Keywords:
Positive and negative affect
Chronic pain
Depression
Sleep problems
Pain interference

ABSTRACT

Objectives: Chronic pain is a significant problem worldwide and is associated with significant elevations in negative affect, depressive symptoms, sleep problems, and physical dysfunction. Positive affect could potentially buffer the impact of pain on patient functioning. If it does, then positive affect could be directly targeted in treatment to benefit individuals with chronic pain. The purpose of this study was to test for such moderating effects.
Methods: This was a cross-sectional study, we administered measures of pain intensity, depressive symptoms, sleep problems, pain interference, and positive and negative affect to 100 individuals with chronic back or knee pain in a single face-to-face assessment session.
Results: The associations between pain intensity and negative affect, and between pain intensity and depressive symptoms were moderated by positive affect. This moderation effect was explained by the fact that participants with low positive affect evidenced strong associations between pain intensity and both depression and negative affect; participants with high positive affect, on the other hand, evidenced weak and non-significant associations between pain intensity and both depression and negative affect. Positive affect did not moderate the associations between pain intensity and either sleep problems or pain interference.
Conclusion: The findings are consistent with the possibility that positive affect may buffer the impact of pain intensity on negative affect and depressive symptoms. Longitudinal and experimental research is needed to determine the potential benefits of treatments that increase positive affect on negative affect and depressive symptoms in chronic pain populations.
Implications: The study findings suggest the possibility that "positive psychology" interventions which increase positive affect could benefit individuals with chronic pain by reducing the impact of pain on negative outcomes. Research to test this possibility is warranted.
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1. Introduction

Chronic pain is a significant problem worldwide, with research showing a median prevalence rate of 15% in adult populations [1]. Moreover, chronic pain becomes more common as people age [2], so its overall prevalence is expected to increase as the population ages. Chronic pain is also often accompanied by negative affect [3], depression [3,4], sleep problems [5–7], and physical dysfunction [8,9]. Although chronic pain, negative affect, depression, sleep problems and physical dysfunction can have individual negative impacts, when occurring together, their combined impact on overall suffering is likely amplified [10,11]. Thus, identifying factors that may diminish the known connections between pain and pain-related outcomes remains an important goal.

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http://dx.doi.org/10.1016/j.sjpain.2016.09.008
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Please cite this article in press as: Thong ISK, et al. The buffering role of positive affect on the association between pain intensity and pain related outcomes. Scand J Pain (2016), http://dx.doi.org/10.1016/j.sjpain.2016.09.008

One factor that could potentially buffer the effects of chronic pain on negative affect, depression, sleep problems and physical dysfunction is global positive affect. Positive affect reflects the extent to which individuals feel energetic, enthusiastic, cheerful, active, and alert [12]. Some investigators have conceptualized positive affect as an important psychological resource that could be enhanced and serve as a resource to buffer the negative effects of stressful situations [13,14]. For example, Fredrickson's broaden-and-build theory proposes that positive affect broadens people's mind sets which builds enduring personal resources that can function as reserves to be drawn on later to manage future threats [15]. This suggests the possibility that people with chronic pain who experience more positive emotions may be more resilient than people with less positive emotions when experiencing pain. Thus, positive affect could "buffer" the negative impact of pain, such that those with more positive affect would show weaker associations between pain and negative outcomes, such as depression, sleep difficulties, and pain interference.

Pain researchers have begun to examine the potential roles of positive affect in adjustment to chronic pain. For example, research shows that measures of positive affect are associated negatively with pain intensity [16–18], negative affect (particularly so during times of high pain) [19], depression [20,21], sleep dysfunction [22], and physical dysfunction [23–26] in individuals with chronic pain. While these results are consistent with the possibility that positive affect could have direct benefits on pain-related outcomes, few studies have investigated the *moderating* (or buffering) role of positive affect on the relationship between pain intensity and pain-related outcomes; that is, whether positive affect buffers the negative impact of pain.

We were able to identify only five studies that have addressed this issue. Three studies found that, among patients with osteoarthritis, rheumatoid arthritis and fibromyalgia, positive affect buffered the effects of pain on negative affect [18,21,27]. However, in a separate study involving patients with fibromyalgia, positive affect failed to moderate the associations between pain and negative affect [28]. In another study, and among patients with knee osteoarthritis, those with high positive affect and high pain reported similar physical activity levels as those without pain, and these two groups had significantly higher physical activity levels than those with low positive affect and high pain [29]. However, to our knowledge no one has yet examined the moderating impact of positive affect on the associations between pain and depression, sleep quality, and pain interference.

The aim of this study was to fill this knowledge gap by testing for a moderating role of positive affect between pain intensity and four domains (negative affect, depressive symptoms, sleep problems, and pain interference) in a sample of individuals with chronic pain. Given the available research findings, cited previously, we hypothesized that positive affect would buffer the negative effects of pain intensity.

2. Materials and methods

2.1. Design

We used a cross-sectional design to test the study hypotheses. Individuals with chronic pain completed a questionnaire assessing their depressive symptoms, sleep problems, pain interference, pain intensity, and positive and negative affect in a single assessment session.

2.2. Participants

A convenience sample of 101 individuals with chronic pain were recruited through referrals from the National University Hospital's (NUH) Orthopedic Spine Clinic, Anesthesia Pain Clinic and the Rheumatology Clinic. Participants were patients of the referring physicians attending their medical appointments. Doctors referred participants according to the following inclusion and exclusion criteria. Inclusion criteria: (1) have a diagnosis by the referring physician of either primarily chronic low back or chronic knee pain (pain lasting for ≥3 months); (2) report an average low back/knee average pain intensity of 4 or greater on a 0–10 Numerical Rating Scale; (3) be at least 21 years old; and (4) be able read, speak, and write in English. Exclusion criteria were: (1) evidence of cognitive impairments (e.g., dementia, intellectual disability) that would interfere with the ability to provide informed consent or complete the study measures; and (2) severe psychiatric or psychological symptoms that would interfere with participation.

2.3. Procedures

Potential participants were identified by clinic physicians and then screened again for eligibility by a research assistant stationed temporarily at the clinic. The research assistant described the study procedures to the potential participant, and interested and eligible participants were asked to sign an informed consent form. Participants were then asked to complete a packet of paper-and-pencil questionnaires assessing depressive symptoms, sleep problems, pain interference, pain intensity, and positive and negative affect. Upon completion, participants were paid 50 Singapore dollars (i.e., about 37 US dollars or 33 euros). Ethical approval was obtained from the National Healthcare Group Domain Specific Review Board.

2.4. Measures

2.4.1. Average pain intensity

Participants were asked to rate their average pain over the last 7 days using the Numerical Rating Scale (0 = "*No pain*", 10 = "*The most intense pain imaginable*"). Numerical Ratings Scales of pain intensity have a great deal of evidence supporting their reliability and validity [30].

2.4.2. Positive and negative affect

Positive and negative affect was measured using the Positive and Negative Affect Scale (PANAS; [12]). The PANAS consists of two 10-item lists of positive and negative affect descriptors (e.g., "*Excited*", "*Strong*", "*Guilty*", "*Afraid*"). Respondents were asked to indicate the extent that they experienced each affect descriptor during the past few weeks on 5-point Likert scales (from "*Very slightly or not at all*" to "*Extremely*"). Scores for the two scales assessing positive and negative affect can range from 10 to 50, with higher scores representing higher levels of each affect domain. A significant level of stability over an 8-week time frame and extensive validity data (e.g., factorial and external validity) for this scale have been reported [12]. The internal consistency of the PANAS Positive and Negative Affect scales in the current sample (Cronbach's alphas) were 0.88 and 0.90, respectively, indicating adequate to excellent reliability.

2.4.3. Depressive symptoms

Depressive symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9; [31]). The PHQ-9 asked respondents to rate the frequency the nine symptoms of depression over the past 2 weeks on 4-point Likert scales ("*Not at all*" to "*Nearly every day*") that reflect the nine DSM-IV criteria for major depression [32]. PHQ-9 scores can range from 0 to 27 with higher scores representing greater symptom severity. This scale has been widely used in clinical and research settings and thus much evidence supporting its validity is available [33–35]. Also, a strong correlation between Beck's Depression Inventory II and the PHQ-9 has been reported,

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