Research papers

Examining the role of positive and negative affect in recovery from spine surgery

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ABSTRACT

Consistent evidence supports a significant association between lower positive affect and higher negative affect and increased pain and disability in adults with chronic pain. However, examining this relation in surgical populations has received little empirical consideration. The primary purpose of this study was to determine whether preoperative and postoperative positive and negative affect predict pain, disability, and functional status after spine surgery. A secondary objective was to assess the relation of depression to postoperative outcomes compared with positive and negative affect. Participants were 141 patients treated by spine surgery for lumbar or cervical degeneration. Data collection occurred at baseline and 6 weeks and 3 months postoperatively. Affect was measured with the Positive and Negative Affect Schedule. Multivariable mixed-model linear regression analyses found that preoperative variables were not predictive of postoperative pain, disability and functional status. However, multivariable postoperative analysis found that 6-week positive affect predicted functional status, and 6-week negative affect predicted pain interference and pain-related disability at 3 months following surgery. Postoperative depression demonstrated statistically significant and stronger associations with pain intensity, pain interference, and pain-related disability at 3-month follow-up, as compared with negative affect. Results suggest that positive affect and depression are important variables to target when seeking to improve postoperative outcomes in a spine surgery population. Recommendations include postoperative screening for positive affect and depression, and treating depression as well as focusing on rehabilitation strategies to bolster positive affect so as to improve functional outcomes after spine surgery.

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1. Introduction

Pain is the most commonly reported symptom in primary care, and musculoskeletal pain accounts for half of all reported pain complaints [38,48]. In addition, spine pain is considered among the most prevalent pain conditions across developed countries [20]. Because of evidence suggesting that chronic pain is not well explained by its pathophysiology alone [57], research has focused on the relation among depression, chronic pain, and disability [39,48]. However, anxiety and depressive symptoms often co-occur in patients with chronic pain, leading to greater pain, disability, and poorer health-related quality of life [6].

Although depression and anxiety symptoms are diagnostically accepted as distinct categories, some researchers argue that these symptoms may more accurately represent overlapping constructs because of frequent co-occurrence, and that the treatment of 1 of them leads to the alleviation of the other [8,22]. In response to this contention, Clark and Watson proposed the Tripartite Model of Affect, which states that depression and anxiety can both be represented by the term *affect* [12]. Specifically, the Tripartite Model categorizes anxiety and depression in terms of negative affect, positive affect, and physiological hyperarousal [43]. Negative affect represents the dysphoric mood characteristic of depression. Positive affect, or positive feelings such as joy, enthusiasm, and energy, is negatively associated with the depressive symptom of anhedonia (a loss of interest in previously enjoyed activities) [76]. Physiological hyperarousal is related specifically to anxiety.

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Numerous studies have examined affect in patients recovering from cardiac and knee surgery [14,23,47,56,68], but no study to date has investigated the relation between affect and outcomes in a spine surgery population. The spine surgery rate in the United States is the highest in the world [21]; however, up to 40% of patients report residual back and neck pain and lower functioning after surgery, as indicated by subjective measures of well-being, health-related quality of life, and disability [9,27,28,40,50,69]. The primary objective of this study was to determine whether preoperative and postoperative positive and negative affect are predictive of postoperative self-reported pain, pain-related disability, and functional status after spinal surgery. A secondary objective was to assess the relation of preoperative and postoperative depression to postoperative outcomes compared with positive and negative affect.

We hypothesized that lower levels of preoperative and postoperative positive affect and higher levels of preoperative and postoperative negative affect would be associated with higher pain and disability and with lower functional status after spine surgery. Our hypothesis is informed by the literature indicating that high negative affect is associated with higher levels of physical complaints, perceived stress, and perceived pain [26,74], whereas positive affect acts as a resiliency factor (i.e., the ability to rebound from and adapt to negative emotional/stressful experiences) [7] in chronic pain conditions [79], and its absence is closely linked to depressive states [61]. We further hypothesized that preoperative and postoperative negative affect would have stronger associations with outcomes as compared with depression based on the Tripartite Model literature suggesting that negative affect encompasses symptoms of both depression and anxiety [72,73,76].

2. Methods

2.1. Participants

Participants for this study were selected from 244 individuals presenting to an academic surgical clinic, between June 2008 and February 2009, to undergo laminectomy and/or fusion surgery for lumbar or cervical degenerative conditions. The following inclusion criteria were used for recruitment purposes: age greater than 18 years; English speaking; duration of pain greater than 6 months; no history of psychotic disease; and score greater than 18 on the Mini-Mental Status Examination. Patients who had surgery for spinal degeneration secondary to scoliosis or lumbar radicular symptoms caused by a prolapsed or sequestered disc were excluded from the study. The study was approved by the Institutional Review Board of Johns Hopkins University School of Medicine, Baltimore, MD.

2.2. Study procedures

It was hypothesized that an examination of positive and negative affect, in addition to depression, may be relevant for patients with chronic spine pain undergoing surgical intervention and may be used to explain variability in postoperative patient outcomes. This study aimed to determine the effects of positive and negative affect on pain, pain-related disability, and functional status in patients undergoing surgery for spinal degeneration. Individuals who met study inclusion criteria were approached for consent before surgery and were asked to complete a baseline assessment consisting of demographic questions and self-report instruments. Six weeks and 3 months after hospital discharge, patients either completed a follow-up assessment during a standard clinic visit, or the battery of self-report instruments were mailed and completed by the patient at home. All study participants received usual care as delivered by the treating surgeon.

2.3. Measures

2.3.1. Sociodemographic and surgery variables

During the baseline assessment, patients were asked their current age in years, sex, race/ethnicity, the highest grade or year in school that they had completed, number of days in the week they exercise, and marital, work, and smoking status. Comorbidities were assessed using the Charlson Comorbidity Index (CCI) [10]. The CCI is a well-validated means of risk adjustment for in-hospital complications and mortality. The type (fusion or other) and area of surgery (lumbar or cervical), and number of prior spine surgeries were abstracted from the medical record.

2.3.2. Positive and Negative Affect Schedule

State measures of affect were assessed using the Positive and Negative Affect Schedule (PANAS) [74]. The PANAS consists of two separate 10-item scales, with a possible range of scores from 20 to 100. Participants were asked to rate the extent to which they experienced each of the affective content descriptors "during the past week" on a rating scale from 1 ("very slightly or not at all") to 5 ("extremely"). The PANAS serves as one of the most widely used affect scales [58] and reliability scores have been estimated at 0.89 for the positive affect scale and 0.85 for the negative affect scale [15]. Both scales account for 62.8–68.7% of the common variance and show good convergent (0.89 to 0.95) and discriminant (−0.02 to −0.18) validity [74].

2.3.3. 9-Item Primary Care Evaluation of Mental Disorders Patient Health Questionnaire

Depressive Symptoms were measured with the 9-Item Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (Prime-MD PHQ-9 [62]). This 9-item tool was developed using the diagnostic criteria from the *DSM-IV*, which scores each of the DSM-IV criteria as "0" (not at all) to "3" (nearly every day). Possible outcome scores range from 1 to 4 (minimal depression), 5 to 9 (mild depression), 10 to 14 (moderate depression), 15 to 19 (moderately severe depression), and 20 to 27 (severe depression). In a psychometric study of the Prime-MD PHQ-9 compared with independent diagnoses made by mental health professionals, the instrument was both sensitive (0.75) and specific (0.90) for the diagnosis of major depression [63]. Reliability scores have been estimated at 0.89 in a primary care population [39].

2.3.4. Brief Pain Inventory

The Brief Pain Inventory (BPI) was used to measure both pain intensity and pain interference with daily activity [13]. The pain intensity scale includes 4 pain items assessing current, worst, least and average pain (0 = no pain at all to 10 = as bad as you can imagine). The pain interference scale is a 7-item scale measuring the degree to which pain interferes with areas of daily life: general activity, mood, walking, work, relations with others, sleep, and enjoyment of life (0 – does not interfere to 10-completely interferes). The BPI has been shown to be reliable (Cronbach's $\alpha > 0.80$) and valid (highly correlated with the Short Form-36 [SF-36] brief pain scale, the Roland Disability Questionnaire, the McGill Pain Questionnaire [MPQ], and the Visual Analog Scale [VAS] for pain) in both surgical patients and patients with chronic low back pain [36,42].

2.3.5. Oswestry Disability Index and Neck Disability Index

Low back disability was measured using a standard patient-centered measure, the Oswestry Disability Index (ODI) [16]. The 10-item ODI assesses the impact of lumbar spinal disorders on 10 aspects of daily living: pain intensity, lifting, sitting, standing, walking, sleeping, hygiene, traveling, social life, and sex life. Ratings for each item are from 0 (high functioning) to 5 (low