A multilevel structural equation modeling analysis of vulnerabilities and resilience resources influencing affective adaptation to chronic pain

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ABSTRACT

The processes of individual adaptation to chronic pain are complex and occur across multiple domains. We examined the social, cognitive, and affective context of daily pain adaptation in individuals with fibromyalgia and osteoarthritis. By using a sample of 260 women with fibromyalgia or osteoarthritis, we examined the contributions of pain catastrophizing, negative interpersonal events, and positive interpersonal events to daily negative and positive affect across 30 days of daily diary data. Individual differences and daily fluctuations in predictor variables were estimated simultaneously by utilizing multilevel structural equation modeling techniques. The relationships between pain and negative and positive affect were mediated by stable and day-to-day levels of pain catastrophizing as well as day-to-day positive interpersonal events, but not negative interpersonal events. There were significant and independent contributions of pain catastrophizing and positive interpersonal events to adaptation to pain and pain-related affective dysregulation. These effects occur both between persons and within a person's everyday life

1. Introduction

Chronic pain adversely affects the physical, cognitive, and emotional states of the person experiencing it [5]. Traditionally, psychosocial vulnerabilities have been the primary focus of studies examining failures of adaptation to chronic pain, but there are also positive psychological mechanisms that promote greater resilience to pain, which may be defined as the preservation of existing positive functioning or protection against subsequent negative emotional states [2,3,17,19,20]. Examination of both positive and negative emotional states as outcomes is therefore necessary when conceptualizing success or failure in adaptation to chronic pain because it is likely that factors of individual resilience and vulnerability are at work at the same time [19]. We sought to expand existing models of pain coping by examining the concurrent mediating roles of maladaptive cognitions about pain and positive and negative interpersonal events in pain-related affective disturbance in a sample of fibromyalgia patients.

Pain catastrophizing, an exaggerated cognitive and affective reaction to an expected or actual pain experience, has been identified as a powerful predictor of emotional functioning in individuals with chronic pain [22]. Pain catastrophizing is a normative yet

maladaptive appraisal process that is motivated by a fear of experiencing pain [6]. Pain catastrophizing has been identified as an important mediator in explaining the relationship between pain experience and average and day-to-day indices of emotional dysregulation, including lower positive affect and greater depressive symptomatology and negative affect [21,22].

Pain coping is not simply an internal process, however; interpersonal relationships may dramatically affect an individual's ability to adapt to chronic pain. Positive social interactions contribute to greater positive affect, a significant source of resilience to chronic pain [13]. Individuals with chronic pain disorders who experience many stressful interpersonal events also appear to be vulnerable to elevations in negative affect [7]. Additionally, when experiencing a pain flare, individuals may withdraw from social situations as an avoidant response or as a result of feelings of being misunderstood or rejected by others [10]. It might thus be expected that positive and negative interpersonal functioning also mediate the relationship between pain and emotional well-being. However, the occurrence of negative interpersonal events appears to blunt the positive effects of positive interpersonal events on a given day, and vice versa [7], which highlights the need to model these influences concurrently in pain adaptation models.

Figure 1 displays the predictions we made in this study. We hypothesized that the influence of pain on affective health would be indirect, mediated by pain catastrophizing and negative

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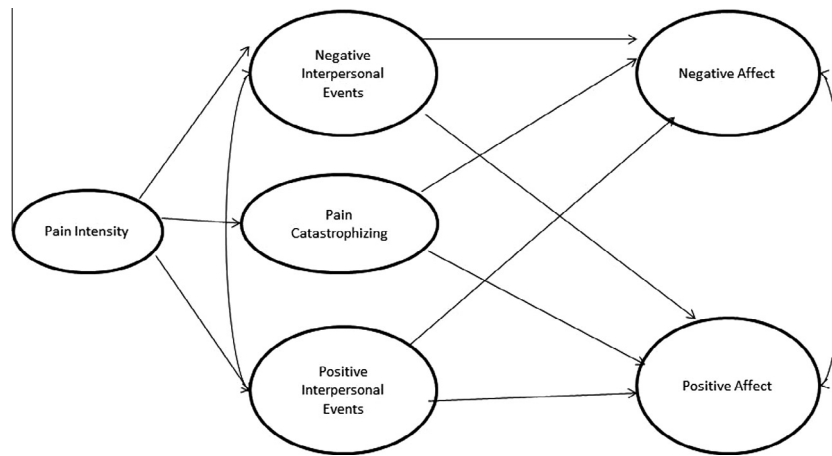 *E-mail address:* jasturge@asu.edu (J.A. Sturgeon).

Fig. 1. Model depicting the direct effects of pain intensity and indirect effects of pain intensity through pain catastrophizing and negative and positive interpersonal events on daily positive and negative affect.

interpersonal events, both of which have been associated with poorer emotional functioning in individuals with chronic pain [7,19,21]. Furthermore, we hypothesized that the relationship between pain and affective changes would be buffered by the protective effects of positive interpersonal events, which have been implicated in enhanced positive emotions and buffered negative emotional states in individuals with chronic pain in past research [7,19].

2. Methods

2.1. Participants

The study sample comprised individuals with fibromyalgia (FM), a rheumatic disorder characterized by widespread bodily pain, fatigue, and high susceptibility to depression [26], and osteoarthritis (OA), a rheumatic disorder defined primarily by joint pain and stiffness [1]. Participants were 260 women between the ages of 38 and 72 (mean age 57.42 years) with a physician-confirmed diagnosis of OA ($n = 106$), FM ($n = 53$), or a dual diagnosis of OA/FM ($n = 101$). Median income in the sample was $30,000 to $39,000 per year. A total of 91.7% of participants reported their ethnicity to be white, approximately 5% reported their ethnicity as Hispanic, and 4% reported their ethnicity as African American (these ethnic categories were not exclusive, as participants could report more than 1 ethnicity). Thirty percent of participants reported being employed full time, 23.6% of participants reported being employed part time, and 43.1% of all participants reported being unemployed. A total of 54.5% of participants were married at the time of data collection.

Participants were recruited in the Phoenix, Arizona, metropolitan area from physician's offices, advertisements, senior citizen groups, and mailings to members of the Southwest chapter of the Arthritis Foundation. Of the 260 participants, 137 (52.3%) responded to radio, television, or newspaper advertisements, 34 (13.1%) responded to flyers from arthritis fairs, 25 (9.6%) responded to postings in physician's offices, 19 (7.3%) responded to postings at a nearby university, 12 (4.6%) reported that they had heard of the study primarily by word of mouth, 6 (2.3%) were participants of prior studies conducted by the research lab that performed the current study and asked to be recontacted for future studies, 3 (1.2%) responded to mailings via the Arthritis Foundation, and 24 (9.2%) did not report their method of recruitment. This sampling method was thought to improve the generalizability of the findings, as it yielded a sample that comprised a variety of individuals that were receiving diverse medical treatments (eg, massage, acu-

puncture, general medical interventions), as well as others that were actively involved in advocacy and other socially connected activities (eg, arthritis fairs, senior citizen groups).

Potential participants first underwent a preliminary screening assessment of FM and OA symptoms by telephone [25]. Upon completion of the telephone assessment, participants signed a Health Insurance Portability and Accountability Act (HIPAA) release form. The research staff then contacted each participant's physician, who sent a written confirmation of the participant's stated diagnosis and disconfirmed diagnosis of other autoimmune disorders, which served as the basis of their inclusion in the study. All participants, regardless of physician diagnosis, underwent an initial in-home assessment, which included a standardized tender point assessment [15] using a standardized dolorimeter and gave their history to nursing staff who were trained and supervised by board-certified rheumatologists. The presence of FM was determined according to the 1990 American College of Rheumatology criteria: history of widespread pain for 3 months or more, and pain in 11 of 18 tender points upon digital palpation [27]. However, the results of the tender point examination were used as a separate measure of pain that was not examined in the current study, and the findings were not used as inclusionary criteria. Included in the study were participants who had no diagnosed autoimmune disorders, a pain rating above 20 on a 0–100 scale, and no involvement in litigation regarding their condition. A cutoff of more than 20/100 for pain, rather than a 30/100 cutoff utilized by other studies [4], allowed the inclusion of participants who were coping well with their chronic pain diagnoses, as well as participants who were reporting comparatively greater levels of pain. Forty-one participants (15.8% of the sample) reported pain levels between 20/100 and 30/100.

2.2. Procedure

After enrolling onto the study, participants were visited by a clinician to reconfirm a diagnosis of FM. Next, participants were trained by a research assistant to use a laptop computer to complete daily diaries each night for 30 days. Participants were encouraged to notify laboratory staff immediately if a problem occurred with the laptop. A built-in date-checking software program prevented data entry on days other than the correct day. In the event of laptop malfunction, a research assistant traveled to the participant's home to replace the malfunctioning laptop with a working one. After completing 30 days of diaries, participants were visited by a clinician, debriefed, and compensated for their efforts. The overall rate of completion was 92.5%. Participants were