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Heterogeneous depression responses to chronic pain onset among middle-aged adults: A prospective study



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ABSTRACT

Studies on depression response to chronic pain are limited by lack of clarification of different forms of response patterns and cross-sectional measures. The current study examined heterogeneous long-term patterns of depression response to chronic pain onset prospectively using the mixture modeling technique. Depression symptoms prior to and following pain onset over a course of six years were charted in a nationally representative middle-aged sample. Four distinct depression symptom trajectories emerged. The *resilience* (72.0%) trajectory describes a pattern of no/minimal depression symptoms prior to and following pain onset. The *post-pain depression* trajectory (11.4%) describes a pattern of low depression at baseline and increasing symptoms following pain onset. The *chronic depression* (6.8%) trajectory is characterized by persistently high depression symptoms irrespective of pain onset. The *prior depression improved* (9.8%) trajectory describes a pattern of high depression at baseline and gradually declining symptoms following pain onset. Self-rated health at both baseline and following pain onset predicted the *resilience* trajectory. Baseline self-rated health distinguished the *post-pain depression* and *chronic depression* trajectories. Individuals in the *prior depression improved* trajectory were older and had more chronic illnesses at baseline but fewer illnesses following pain onset, compared to those in the *resilience* or *post-pain depression* trajectory.

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1. Introduction

Chronic pain is a prevalent and potentially debilitating health condition. In the United States, it is estimated that more than one-third of the population are living with chronic pain (Institute of Medicine, 2011), and pain-related complaints are one of the leading causes for physician visits (Gatchel, 2004). Pain experiences are aversive and noxious, and adjustment to pain typically involves prolonged treatments and rehabilitation programs which effectiveness are yet to be proven (Turk et al., 2011). Given the challenges facing individuals with chronic pain, it is not surprising that heightened rates of psychological dysfunction are found in this population (Dersh et al., 2002). In particular, a substantial body of research has documented higher prevalence rates of depression among pain patients (Bair et al., 2003; Sharp and Keefe, 2005; Tunks et al., 2008) than those among other medical populations (Livingston et al., 2000).

Studies on depression response to pain have almost exclusively focused on the detection of depression at one time point, based on a predetermined set of criteria or score defining the mental

disorder. This body of research has laid important groundwork for the understanding of the prevalence, as well as risk factors, of depression outcome to pain. There are, however, several limitations to this approach. First, predefined categories of presence or absence of depression depend heavily on assessment methods and theoretical grounding, which may vary across studies, leading to inconsistent results. Moreover, dichotomous division of depression versus non-depression may obscure other meaningful response patterns to pain experiences (Bonanno, 2004; Bonanno et al., 2011). In particular, individuals with few or no depression symptoms, typically being grouped into the same category as those who show sub-threshold depression, may in fact represent a pattern of healthy adjustment, and investigation of this form of response could lead to insights into protective factors against the development of depression to pain.

Although not specifically focused on depression response, a line of research has started to investigate the nature and prevalence of healthy, or resilient adjustment, to pain (Strugeon and Zautra, 2010; Yeung et al., 2012; Karoly and Ruehlman, 2006). Karoly and Ruehlman (2006) identified a group of “pain resilience” individuals, defined as low emotional distress and low pain-related functional interference in the presence of high chronic pain severity. They found that the pain resilience group demonstrated higher task persistence, less pain-related fear, less catastrophizing

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Table 1
Demographic summary of the sample.

	N	Percentage (%)		N	Percentage
Gender			Marital status		
Male	717	33.0	Married	1549	71.3
Female	1455	67.0	Divorced/separated/widowed	510	23.5
Missing	0	0.0	Never married	86	4.0
Race/Ethnicity			Missing	27	1.2
White	1520	70.0	Employment		
Black	349	16.1	Employed	1281	59.0
Hispanic	257	11.8	Unemployed	601	27.7
Others	46	2.1	Retired	268	12.3
Missing	0	0.0	Missing	22	1.0
Education			Household income		
High school or below	1364	62.0	< \$10,000	272	12.5
College or some college	644	29.7	\$10,000 – \$100,000	1617	74.4
Graduate or professional school	177	8.1	> \$100,000	281	12.9
Missing	5	0.2	Missing	2	0.1

thoughts, and less dependence on health care support than a demographically matched non-resilience group. The study provides initial evidence that healthy adjustment (i.e., low depression) is a legitimate form of psychological response to pain, and suggests several possible protective factors that may buffer the impact of pain experiences. Nevertheless, as in depression and pain research, studies on “pain resilience” also rely on theoretical conceptualization for group designation, and are therefore subject to artificial division of groups.

Another limitation of the existing studies is the paucity of longitudinal data on the course of depression among pain patients, especially measures on pre-pain depression symptoms. Several studies have reported an increased risk of persistent depression for those who have elevated depressive symptoms prior to pain onset (Katon et al., 1994; Magni et al., 1994). Investigation of pre-morbid depression is made more important as this form of depression response may be informed by risk factors that are different from those associated with depression developed in reaction to pain.

Concurrence of pain and depression is associated with more pain symptoms, higher pain intensity, longer pain duration, as well as higher rates of disability and health care utilization, in comparison to pain condition alone (Bair et al., 2003; Arnow et al., 2006). The greater burden imposed by the comorbidity on both the patients and health care system calls for more systematic and refined investigation of depression responses among individuals who suffer from chronic pain. The current study utilized a recently developed statistical approach, Latent Growth Mixture Modeling (LGMM), to prospectively chart longitudinal depression trajectories to pain onset among a nationally representative sample over the course of six years. The mixture modeling technique maps longitudinal response patterns based primarily on the intrinsic properties of the data structure (Muthén, 2004), which largely overcomes the limitation of priori assumptions in group assignment. It has been suggested that the middle-aged population is at particularly high risk of psychological dysfunction following pain, and that psychosocial mediators of pain-depression association might be age specific (López-López et al., 2008). Hence the ages of the sample were limited to 45–65 years old, in order to minimize the impact of age on the trajectories.

We also investigated predictors that could differentiate depression trajectories. Based on previous research on pain and depression comorbidity, three health-related predictors, namely pain-induced functional impairment, chronic illness and perceived health, were selected. Studies using a variety of pain samples and assessment methods have consistently suggested pain-induced functional

impairment to be robustly associated with comorbidity of pain and depression (Bair et al., 2003). In a global study of pain patients in primary care from 14 countries, impairment to daily activities emerged as the strongest predictor of depression or anxiety (Gureje et al., 2001). We also assessed the number of other concurrent medical conditions, as their presence may increase the risk of depression among chronic pain patients (Ohayon and Schatzberg, 2003). On the other hand, subjective perception of health status could contribute significantly to the development of depression, above and beyond pain-related complaints and other medical conditions (Carroll et al., 2003). We included both pre- and post-pain measures of medical illness and perceived health for their possible differential effects on the trajectories (Gatchel, 2004). Finally, the predictive values of a wide range of demographic variables, including age, gender, marital status, employment status, household income and ethnicity, were also examined.

2. Method

2.1. Study background

Data were obtained from the public release of the Health and Retirement Study (HRS, University of Michigan). The HRS is a longitudinal, nationally representative study surveying older Americans and their spouses once every two years on various mental and physical health-related aspects between 1992 and 2010. Overall response rates ranged from 80.4% to 89.4% across the survey years.

2.2. Subjects

To ensure that each subject had one Baseline (BL) and at least three measured time points following pain onset (T1, T2, T3), a floating baseline method was used. Subjects who reported moderate or severe pain in any wave between 1996¹ and 2006 (T1) and no pain in the immediate previous wave (BL) were selected. The ages of the subjects were limited to between 45 and 65. This resulted in a total of 2453 individuals. In order to improve the accuracy of initial depression response to pain onset, subjects who had no valid depression scores at either BL or T1 were excluded from the study, giving a final sample of 2172 individuals (73.2% with moderate pain and 26.8% severe pain). The demographic characteristics of the sample are summarized in Table 1. Eighty six percent of the sample had depression measures at all four time points, and 91% had depression measures at three time points. The excluded cases ($N=281$; 11.5%) comprised a slightly larger proportion of individuals with moderate pain (76.5%; $\chi^2=6.425$, $p<0.05$) than did the final sample. The two samples did not differ in pain-related functional impairment ($\chi^2=2.340$, $p>0.05$).

¹ The depression measure in 1992 comprised more items than the one used in subsequent years. To ensure consistency, data from 1992 was excluded in the study.

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