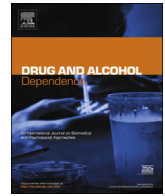




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Dispositional mindfulness and prescription opioid misuse among chronic pain patients: Craving and attention to positive information as mediating mechanisms



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ABSTRACT

Objectives: Opioid-treated chronic pain patients may be at risk for prescription opioid misuse due to heightened opioid craving coupled with deficits in attention to naturally rewarding, positive stimuli. Conversely, dispositional mindfulness, which is associated with reduced craving and increased responsiveness to natural rewards, may serve as a protective factor and buffer opioid misuse risk. The current investigation aimed to examine the association between mindfulness and opioid misuse, and to test opioid craving and attention to positive information as mediators of this relationship.

Methods: This cross-sectional analysis examined data obtained from a sample of civilian opioid-treated chronic pain patients in the Southeastern U.S. (Sample 1: N = 115), as well as civilian (Sample 2: N = 141) and military samples in the Intermountain West (Sample 3: N = 44). Pearson correlations and path analyses were employed to test relations among participant self-reports on the Current Opioid Misuse Measure (COMM), the Five Facet Mindfulness Questionnaire (FFMQ), two measures of opioid craving, and the Attention to Positive and Negative Information Scale (APNIS).

Results: Across all three samples, dispositional mindfulness was significantly inversely associated with opioid misuse (N = 300, $r = -0.36$, $p < .001$). Reduced opioid craving and increased attention to positive information mediated the association between dispositional mindfulness and opioid misuse.

Discussion: Dispositional mindfulness may buffer opioid misuse risk by attenuating opioid craving and enhancing attention to naturally rewarding stimuli.

1. Introduction

Long-term exposure to prescription opioids during chronic pain treatment may lead to misuse and addiction by inducing neuroplastic changes in the mesocorticolimbic dopamine system (Volkow et al., 2016). Recent estimates suggest that nearly 25% of chronic pain patients are at risk for developing opioid misusing behaviors such as dose escalation and self-medication of negative affect with opioids (Vowles et al., 2015). These opioid misuse behaviors are associated with myriad negative outcomes, including loss of functioning in major life domains, disrupted interpersonal relationships, physiological dependence, addiction, and accidental overdoses (Atluri et al., 2014; Birnbaum et al., 2011; Martell et al., 2007). Though the pathogenesis of opioid misuse

among chronic pain patients is still incompletely understood, the downward spiral model (Garland et al. 2013a) posits that opioid craving and insensitivity to natural rewards are two key factors that promote the development of opioid misuse and addiction. The magnitude of this problem cannot be overstated. In 2015, over 33,000 deaths involved unintentional overdose of opioids. Most of those individuals were initially exposed to opioids through treatment of acute and chronic pain. Given that between 10% and 55% of adults in the United States experience chronic pain (Nahin, 2015) and four million individuals are prescribed opioids each year (Okie, 2010), research elucidating risk and protective factors that influence opioid misuse among chronic pain patients is crucial.

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1.1. Opioid craving

Craving is a primary risk mechanism for opioid misuse. Craving is a subjective emotional-motivational state coupled with autonomic changes (Carter and Tiffany, 1999) and activation in brain networks instantiating attention, interoception, and reward processing (Koob and Volkow, 2016; Naqvi et al., 2014). The incentive-sensitization theory of addiction posits that recurrent drug use causes neuroadaptations in the mesocorticolimbic dopamine system, leading to sensitization to drug-related cues, manifested by subjective craving and psychophysiological indices of drug cue-reactivity (Berridge and Robinson, 2016). Craving for illicit opiates has been extensively documented (Franken et al., 2002). Similarly, chronic pain patients also exhibit craving for prescription opioids, including reports of experiencing urges for more medication and preoccupation with their next dose (Wasan et al., 2012). Furthermore, prescription opioid craving may confer future risk of opioid misuse. In that regard, in a sample of treatment-seeking chronic pain patients, cue-elicited prescription opioid craving predicted opioid misuse risk 20 weeks following treatment (Garland et al., 2014a,b).

1.2. Attention to naturally rewarding, positive stimuli

Risk for opioid misuse may also be occasioned by blunted responsiveness to natural, non-drug rewards caused by chronic opioid exposure. Chronic pain patients treated with opioids are more vulnerable to anhedonia when compared to chronic pain patients who do not take opioids (Grattan et al., 2012; Jensen et al., 2006; Shurman et al., 2010; Sullivan et al., 2006). Moreover, opioid misusing chronic pain patients evidence reduced attentional and autonomic responses to naturally-rewarding stimuli relative to patients who take opioids as prescribed (Garland et al., 2015a,b, 2017a,b), and such decreased reward responsiveness has been found to predict future opiate use (Lubman et al., 2009). Putatively, there may be an inverse relation between drug-related incentive salience and reduced natural reward responsiveness; that is, as chronic opioid users become hypersensitized to opioid-related cues, they may become less responsive to non-drug related natural rewards, manifested by reduced attention to positively-valenced stimuli in the social environment. This reward deficit may in turn result in dysphoria and heightened sensitization to pain (Borsook et al., 2016; Shurman et al., 2010), compelling patients to increase their opioid dose to maintain a sense of hedonic equilibrium.

1.3. Dispositional mindfulness

In contrast to these risk factors, dispositional or trait mindfulness may serve as a protective factor against opioid misuse, in light of evidence that dispositional mindfulness is associated with reduced craving (Garland et al., 2012; Garland and Roberts-Lewis, 2013) and enhanced responsiveness to natural rewards (Thomas and Garland, 2017). Dispositional mindfulness has been defined as the propensity to embody mindful qualities in daily life (Baer et al., 2006). These mindful qualities have been operationalized as five distinct facets of dispositional mindfulness: the ability to *observe* and *describe* interoceptive, affective, and exteroceptive experience, to *act with awareness* rather than out of automaticity, and to embody a *nonjudgmental* and *nonreactive* response to distressing thoughts and emotions (Baer et al., 2006). This trait-like characteristic, which is normally distributed among healthy individuals (Walach et al., 2006), can be enhanced through mindfulness-based interventions (Quaglia et al., 2016), and mindfulness training-related increases in facets of dispositional mindfulness (i.e., non-reactivity) have been shown to predict decreases in opioid misuse among chronic pain patients (Garland et al., 2014a,b).

Hypothetically, individuals higher in dispositional mindfulness may be less prone to experience craving than those reporting lower dispositional mindfulness. Alternatively, in light of evidence that

dispositional mindfulness is associated with greater capacity to self-regulate attentional and autonomic responses to substance-related cues (Garland, 2011), mindful individuals may be better able than their less mindful counterparts to regulate craving by shifting attention away from thoughts and feelings related to opioid use and toward naturally occurring, non-drug rewards. With respect to opioid-treated chronic pain patients, the tendency for dispositionally mindful individuals to exhibit greater reward responsiveness (e.g., Garland et al., 2017a) may be manifested in a cognitive tendency to focus on positive information, a capacity that has been associated with sensitivity to signals of reward in healthy samples (Noguchi et al., 2006a).

1.4. Study aims

The present investigation sought to examine the relationship between dispositional mindfulness and prescription opioid misuse among opioid-treated chronic pain patients, a population at heightened risk for addictive behaviors. Theoretical and empirical evidence suggests that increased craving and reduced natural reward responsiveness may promote opioid misuse. Yet, further evidence suggests that dispositional mindfulness may attenuate these pathogenic psychological mechanisms. As such, we hypothesized that the association between dispositional mindfulness and prescription opioid misuse would be mediated by craving and attention to positive information. To test the various components of this hypothesis in a stepwise fashion, we analyzed data collected from three distinct samples of opioid-treated chronic pain patients. In Study 1, we tested craving as a mediator of the association between mindfulness and opioid misuse. In Study 2, we tested attention to positive information as a mediator of the association between mindfulness and opioid misuse. In Study 3, both mediational pathways were tested simultaneously in a multivariate path model to determine whether these two indirect effects were independent.

2. Study 1

2.1. Participants and procedure

Participants (N = 115) suffering from an array of chronic pain conditions (e.g., low back pain, cervical pain, joint pain, and fibromyalgia) were recruited between 2011 and 2012 from primary care clinics, pain clinics, and neurology clinics in Tallahassee, Florida through flyers and online classified ads. Inclusion criteria required that participants reported chronic, non-cancer-related pain and had been prescribed and were taking opioid analgesics for \geq five days a week for the past 90 days or more (Chou et al., 2009). Participants were excluded if they were actively suicidal or psychotic, which was assessed with the Mini-International Neuropsychiatric Interview 6.0 (MINI; Sheehan et al., 1998).

2.2. Materials and methods

Following psychiatric screening, eligible and consenting participants completed several validated self-report measures that captured demographic and clinical information. Participants were paid \$25 for completing the study protocol. The institutional review board and Human Subjects Committee at Florida State University (where the last author was located at the time of data collection) reviewed and approved the study.

2.2.1. Dispositional mindfulness

Dispositional mindfulness was measured using the well-validated, Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006), a 39-item scale comprising five domains: observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience. Participants rated items on a five-point Likert-type scale (1 = never or very rarely true, 5 = very often or always true), from

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