



## Prescription opioid use among university students: Assessment of post-cue exposure craving



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### HIGHLIGHTS

- Evaluated the impact of prescription opioid cue exposure on craving in students
- Evaluated the association between craving and other variables
- Cue exposure increased craving among those exposed to opioid stimuli.
- Craving was associated with negative mood.
- Craving was associated with procuring opioids from non-medical sources.

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### ABSTRACT

Despite the increasing number of prescriptions written to adolescents and young adults for opioid analgesics, the rise in non-medical use of such drugs among university students, and the potential role of craving in the misuse of opioids, there have been no published studies assessing craving for prescription opioids in this population. Therefore, the current study was designed to assess the impact of prescription opioid-related cue exposure on craving in university students. Students ( $n = 277$ ) recruited from a large university in the Midwestern United States were randomly assigned to two conditions to test the impact of cue exposure to either prescription opioid-related stimuli or control stimuli. Relative to the control condition, prescription opioid-related cue exposure significantly increased overall craving, desire and intention to use prescription opioids, relief from negative states by using prescription opioids, and perceived control over prescription opioid use. In addition, when assessing correlates of post-cue exposure craving, negative mood and procurement of prescription opioids from non-medical sources were the only measured variables that were significantly associated with overall craving and/or any of the craving measure's subscales. Craving may be important aspect of prescription opioid use among university students. Future research assessing craving as a function of non-medical user subtype is warranted.

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### 1. Introduction

Over the past two decades, there has been a substantial increase in the number of prescriptions written for opioid analgesics to young adults (Fortuna, Robbins, Caiola, Joynt, & Halterman, 2010; Thomas, Conrad, Casler, & Goodman, 2006). For example, Fortuna et al. (2010) found that, from 1994 to 2007, the number of prescriptions written for opioid analgesics during any ambulatory or emergency department visits nearly doubled from about 5% to over 8% in those aged 20 to 29 years and from about 3% to nearly 6% in those aged 15 to 19 years, regardless of whether the visit was injury- or non-injury-related. Although most young adults use their medications appropriately (McCabe et al., 2011), research has documented a rise in the non-

medical use of these opioids among university students (Johnston, O'Malley, Bachman, & Schulenberg, 2008; Mohler-Kuo, Lee, & Wechsler, 2003). This research is aligned with studies suggesting that young adults are among the most vulnerable age group using prescription opioids (Blanco et al., 2007; Catalano, White, Fleming, & Haggerty, 2011; Johnston et al., 2008).

Studies have identified several differences in characteristics between medical users of prescription opioids and non-medical users of prescription opioids. For example, research on Lebanese university students (Ghandour, El Sayed, & Martins, 2013) and American high school seniors (McCabe et al., 2011) indicates that non-medical users of prescription opioids are more likely to use illicit drugs marijuana, ecstasy, cocaine, and alcohol compared to medical users. However, as Zacny et al. (2003) illustrate, many of the young adults who use prescription opioids non-medically started using them as prescribed. Similarly, Canfield et al. (2010) demonstrated that many patients in opioid detoxification (regardless of whether they were using heroin or

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prescription opioids) started using opioids that were obtained through 'legitimate means.' Therefore, it is also important to examine students using prescription opioids medically.

While epidemiological studies have helped identify prevalence and factors associated with medical and non-medical use of opioids, few experimental investigations of phenomena that may be associated with prescription opioid use have been performed. Identifying context-specific factors that are associated with prescription opioid use may be important in guiding treatment recommendations for university students who are experiencing opioid-related problems (Ghandour et al., 2013). One potential factor that may contribute to prescription opioid use is craving. While some researchers consider craving an important aspect of opioid abuse (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Tiffany, 1990), research has been mixed (Epstein, Marrone, Heishman, Schmittner, & Preston, 2010; Paliwal, Hyman, & Sinha, 2008; Shadel et al., 1998; Walton, Blow, Bingham, & Chermack, 2003). Nonetheless, many researchers consider craving to be an essential feature of substance use that can be used as a clinical outcome, diagnostic tool, and/or a primary clinical target (Tiffany & Wray, 2012) in treatment.

Despite the potential utility of assessing craving for prescription opioids among university students, there have not been any published studies that have done so. Therefore, the present study was designed to accomplish several goals. The first goal was to compare the impact of exposure on craving to an imagery script on using prescription opioids versus exposure to an imagery script that is unrelated to prescription opioids. Assessment of cue reactivity included a multi-dimensional craving measure and a positive and negative mood measure. It was expected that craving would increase following exposure to the prescription opioid-related imagery script and not the control cue exposure script. In addition, when including potential changes in positive and/or negative mood, the increase in craving would persist in the prescription opioid-related cue exposure condition. If increased craving persists after controlling for the variance explained by changes in mood, this strengthens the argument that the increase in craving after cue exposure was not due to changes in mood. This is especially relevant given previous research demonstrating a strong link between mood and craving (Childress et al., 1993; Sinha, 2001).

Second, to help identify factors that may contribute to or exacerbate craving, correlates of post-prescription opioid-related cue exposure were assessed, with special attention to pain and non-medical use of prescription opioids. The interest in the relationship between pain and craving was two-fold. First, assessing pain has been understudied in university students (Kennedy, Kassab, Gilkey, Linnel, & Morris, 2008). Second, studies among patients in pain clinics, inpatient drug treatment, and methadone maintenance programs have found significant associations between craving and pain (Rosenblum et al., 2003; Wasan et al., 2009; Wilsey, Fishman, Li, Storum, & Albanese, 2009). In addition, assessing the relationship between craving and non-medical use of prescription opioids would potentially extend findings on differences between those using prescription opioids medically versus non-medically.

## 2. Method

### 2.1. Participants and procedure

After receiving approval from the Institutional Review Board, undergraduate students in psychology courses at a large Midwestern university in the United States were recruited using a web-based subject pool from February 2013 to April 2013. The subject pool system indicated that the purpose of the study was to assess "the experiences of thoughts and feelings about prescription opioids after reading a story" and that individuals were eligible if they were at least 18 years of age. Participants were told that they would receive class credit for participating and that they could participate regardless if they had ever used prescription opioids. This was to help preserve the anonymity of those

who had used prescription opioids and to decrease the likelihood that individuals would report previous prescription opioid use only to receive class credit. However, those reporting that they had never used prescription opioids were removed from analysis. To ensure participants were informed of what was considered prescription opioids, they were provided (in the consent and again in the questionnaires) a comprehensive list of names of prescription opioids used by Ilgen et al. (2011).

The subject pool system contained a link that invited potential participants to click the study website link that contained the consent document and the materials listed in the measures section below. Following receipt of informed consent, participants completed a pre-cue exposure craving assessment and were then randomly assigned to receive either control cue exposure or active cue exposure (both described below). After the cue exposure, participants completed another craving assessment and the remaining questionnaires. To conclude, participants were debriefed and given research participation credit.

A total of 642 individuals clicked the link on the survey, 50 of which did not complete more than one questionnaire. An additional 316 respondents were not analyzed because they reported that they have never "used prescription opioids for any reason." Among those 277 participants who completed the survey and had used prescription opioids in their life, 71.4% were female and 88.0% were Caucasian. The mean age of the sample was 19.7 years ( $SD = 2.3$ ), and the majority were in their first or second year of university (77.7%). A minority of the participants reported using prescription opioids in the last 30 days (27.7%) with hydrocodone being the most commonly reported opioid used in the past 30 days (18.7%) and lifetime (75.0%). Although almost the entire sample reported taking the opioids orally (94.8%), nearly one-quarter of the sample (22.7%) reported any non-oral routes of administration. In addition, nearly one-third of the sample (31.4%) reported procuring opioids through non-medical means. Approximately half of the participants (49.5%) reported that they had experienced pain in the last 3 months. See Table 1 for additional data on prescription opioid use, experience of pain in the last 3 months, and demographics.

### 2.2. Measures

#### 2.2.1. Drug Desires Questionnaire (DDQ)

The DDQ was originally designed to assess current craving for heroin (Franken, Hendriks, & Van Den Brink, 2002). The adaptation for prescription opioids asked respondents to indicate their level of agreement with each of the 13 items using a seven-point Likert Scale. Franken et al. (2002) reported that the DDQ demonstrated good convergent validity, internal consistency, and test-retest reliability. The DDQ is comprised of three subscales: Desire and Intention ("My desire to use prescription opioids now seems overwhelming"), Negative Reinforcement ("Using prescription opioids right now would make me feel less tense"), and Control ("I could limit how much prescription opioids I would use if I used now"). Pre- and post-cue exposure internal consistency reliabilities were .79 and .92 for the overall scale score, .83 and .92 for Desire and Intention subscale scores, .84 and .93 for Negative Reinforcement subscale score, and .59 and .66 for Control subscale score, respectively.

#### 2.2.2. Mood Form

The Mood Form is a nine-item measure of positive mood (i.e., happy, joyful, pleased, enjoyment/fun) and negative mood (i.e., depressed/blue, unhappy, frustrated, worried/anxious, angry/hostile). Respondents were asked to rate each mood on a seven-point scale from 0 ("Not at all") to 6 ("Extremely"). Composite positive and negative mood scores are calculated by averaging the individual items comprising each subscale. Diener and colleagues (Diener & Emmons, 1984; Diener, Larsen, Levine, & Emmons, 1985) reported that the Mood Form demonstrated high internal consistency reliability, test-retest reliability, and concurrent validity. Internal consistency reliabilities were .88 for positive moods and .86 for negative moods.

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