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Impulsivity but not sensation seeking is associated with opioid analgesic misuse risk in patients with chronic pain

Elise N. Marino^a, Kristen D. Rosen^a, Antonio Gutierrez^a, Maxim Eckmann^a, Somayaji Ramamurthy^a, and Jennifer Sharpe Potter^a

^aThe University of Texas Health Science Center at San Antonio, 7526 Louis Pasteur, San Antonio, TX 78229, United States

Abstract

Impulsivity and sensation seeking have been associated with substance use disorders, including opioid use disorders. This pilot study sought to examine whether impulsivity and sensation seeking, as measured by the Barratt Impulsiveness Scale (BIS) and Sensation Seeking Scale (SSS), were associated with opioid analgesic misuse risk in chronic, low-back pain patients prescribed opioid analgesics. Participants were 42 chronic, low-back pain patients enrolled in a larger study examining problematic opioid analgesic use. Impulsivity was assessed using the BIS, sensation seeking was measured using the SSS, and opioid analgesic misuse risk was assessed using the Current Opioid Misuse Measure (COMM). Significant bivariate associations were found between the COMM and the following predictor variables: age and the three BIS subscales: Attentional Impulsiveness, Non-planning Impulsiveness, and Motor Impulsiveness. Using a multivariate linear regression, after controlling for age, the BIS subscales accounted for 29.0% of the variance in the COMM. Attentional Impulsiveness was the only significant BIS subscale. These results suggest a potential relationship between impulsivity, but not sensation seeking, and risk for opioid analgesic misuse. Impulsivity is not a prominent trait observed in chronic pain patients; however, it may be an important risk factor for opioid analgesic misuse for a subset of individuals with chronic pain. As such, these findings suggest additional exploration of this potential risk factor is warranted.

Keywords

Opioid misuse; Impulsivity; Sensation seeking; Chronic pain

Corresponding author: Jennifer Sharpe Potter, Ph.D., M.P.H., The University of Texas Health Science Center, Department of Psychiatry, 7526 Louis Pasteur MC7733, San Antonio, TX 78229, USA, Phone: (210) 562-5438, Fax: (210) 562-5403, PotterJS@uthscsa.edu.

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Contributors

Elise N. Marino, B.A. performed the statistical analyses and drafted the manuscript. Jennifer Sharpe Potter, Ph.D., M.P.H. and Kristen D. Rosen, M.P.H. designed the study, wrote the protocol, and significantly contributed to the development of the manuscript. Antonio Gutierrez, M.S. executed study procedures. Somayaji Ramamurthy, M.D. and Maxim Eckmann, M.D. assisted with study procedures. All authors have approved the final manuscript.

Conflict of interest

No conflict declared.

1. Introduction

Opioid analgesic misuse has become a public health concern. In 2007 and 2008, opioid analgesics were associated with more drug overdose deaths and emergency department visits than heroin (Centers for Disease Control and Prevention, 2010). Opioid analgesic misuse is a growing concern in chronic pain patients, with studies reporting as high as a 31% prevalence rate of opioid misuse in this population (Kahan, Srivastava, Wilson, Gourlay, & Midmer, 2006). While not all of these individuals go on to develop an opioid use disorder, the risk for misuse has become a concern for physicians treating chronic pain. Misuse includes taking the medication in a manner other than how it is prescribed (Savage et al., 2003).

Impulsivity is a multifaceted construct commonly defined in terms of deficient inhibition of behaviors and impaired decision-making. Findings from both animal models and human studies consider impulsivity to be a risk factor for the emergence, as well as a consequence of substance use disorders (for review, see de Wit, 2008). As such, the association between impulsivity and substance use disorders is well documented (Bornovaalova, Daughters, Hernandez, Richards, & Lejuez, 2005; Conrod, Pihl, Stewart, & Dongier, 2000; Dick et al., 2010; Dolan, Bechara, & Nathan, 2008; Ersche, Turton, Pradhan, Bullmore, & Robbins, 2010). In particular, impulsivity is associated with opioid use disorders. There is evidence from animal models that found morphine increased impulsivity in the rat (Kieres et al., 2004; Pattij, Schetters, Janssen, Wiskerke, & Schoffemeer, 2009). Further, human studies have observed that opioid dependent individuals display higher levels of impulsivity compared to controls (Kirby, Petry, & Bickel, 1999; Nielsen et al., 2012; Robles, Huang, Simpson, & McMillan, 2011).

Sensation seeking, defined as seeking novel and intense experiences with the willingness to accept the associated risks, is also considered a risk factor for the development of illicit substance use (Malmberg et al., 2012). High sensation seeking has been associated with substance abuse (Ball, Carroll, & Rounsaville, 1994; Wagner, 2001) and substance dependence (Adams, Kaiser, Lynam, Charnigo, & Milich, 2012; Conrod et al., 2000; Ersche et al., 2010; Shin et al., 2012). Interestingly, Conrod et al. (2000) in an examination of substance abusing women found that sensation seeking was associated with alcohol dependence but not opioid dependence. However, others have recognized an association between high sensation seeking and opioid use disorders (Andruci, Archer, Pancoast, & Gordon, 1989; Franques et al., 2003; Kosten, Ball, & Rounsaville, 1994).

The existing literature, albeit somewhat limited with regard to opioids, suggests that impulsivity and sensation seeking are important risk factors to consider in the onset of an opioid use disorder in substance use disorder treatment samples. Examining the relationship between these constructs and opioid analgesic misuse risk in a chronic pain population provides a unique opportunity to examine these risk factors in a non-substance use disorder treatment sample. As opioid analgesics may be an appropriate course of treatment for these patients, better understanding the role impulsivity and sensation seeking play in the development of opioid analgesic misuse may elucidate risk for misuse in these individuals. Identifying such risk factors may then lead to methods for identifying those at risk and strategies for potentially preventing the development of opioid abuse and then, more severely, dependence in this clinical population.

The objective of this pilot study was to examine the relationship between impulsivity, sensation seeking, and opioid analgesic misuse risk in chronic pain patients prescribed opioid analgesics. Consistent with prior research in opioid dependent populations described

above, we hypothesized that high impulsivity and sensation seeking would be associated with greater risk for opioid analgesic misuse.

2. Method

2.1 Participants

As shown in Table 1, participants were 42 chronic low-back pain patients (23 Female, 19 Male) currently receiving treatment at a local pain specialty clinic and receiving opioid therapy for chronic pain management. Mean age was 47.5 ($SD=10.1$) years, 30 (71.4%) were White, and 20 (47.6%) were Hispanic. Participants averaged 12.6 ($SD=1.4$) years of education. Average pain severity was 7.4 ($SD=1.6$), and pain interference was 7.5 ($SD=1.9$).

2.2 Materials

2.2.1 Pain—The Brief Pain Inventory (BPI; Cleeland & Ryan, 1994) is a self-report questionnaire, which was used to determine participants' degree of pain and pain interference. Four questions regarding participants' level of pain were averaged to obtain a pain severity score, and seven questions regarding pain interfering with daily activities were averaged to obtain a pain interference score.

The Chronic Pain Acceptance Questionnaire (CPAQ; McCracken, Vowles, & Eccleston, 2004) was used to characterize participants based on their level of acceptance of their chronic pain condition. Scores were summed from the two subscales: activities engagement and pain willingness.

2.2.2 Impulsivity—The Barratt Impulsiveness Scale (BIS-11; Patton, Stanford, & Barratt, 1995) is a 30-item self-report questionnaire that characterizes impulsivity as lacking control over attention, behavior, and cognition by measuring some of the ways the respondent thinks and acts. The BIS contains three subscales, including Attentional Impulsiveness, Motor Impulsiveness, and Non-planning Impulsiveness. Cronbach's alpha for the BIS ranged from .79-.83 (Patton et al., 1995).

2.2.3 Sensation Seeking—The Sensation Seeking Scale (SSS-V; Zuckerman, Eysenck, & Eysenck, 1978) is a 40-item self-report questionnaire that assesses sensation seeking by measuring the respondent's preference towards one of two varying sensations or situations. The SSS contains four subscales, including Thrill and Adventure Seeking, Experience Seeking, Disinhibition, and Boredom Susceptibility. Cronbach's alpha ranged from .75-.80 for the four subscales (Roberti, Storch, & Bravata, 2003).

2.2.4 Opioid Misuse Risk—The dependent measure was the Current Opioid Misuse Measure (COMM; Butler et al., 2007), which was used to identify opioid analgesic misuse risk. The COMM, a 17-item self-report questionnaire, measures the respondent's risk for abusing prescription pain medication by asking about current (past 30 days) behaviors and thoughts related to opioid use. Cronbach's alpha for the COMM was .83 (Butler, Budman, Fanciullo, & Jamison, 2010).

2.3 Procedures

Participants were recruited based on their participation in a larger, observational study examining problematic opioid analgesic use, which took place at a local pain specialty clinic. All study procedures received IRB approval. In order to be eligible for the primary study, participants had to present at the pain clinic due to chronic, low-back pain, which was not a result of cancer, recent surgery, or medical trauma, and have used prescribed opioids at least 20 of the past 30 days. For reasons related to the primary study objectives, participants

included in this secondary analysis had CPAQ scores in the lower tertile or upper tertile of responses based on prior completion of this instrument. If eligible, they were given an appointment and asked to attend a session at the research lab, where they provided written informed consent and completed the assessments: demographics form, BIS, SSS, and COMM, as well as other assessments not pertinent to this study. Participants were then compensated \$50 for their time.

2.4 Data Analysis

Data were analyzed using SPSS Version 19. Two-tailed Pearson correlation coefficients were calculated to determine bivariate associations among the predictor variables and the criterion variable. Significant associations were then examined using multivariate linear regression to determine which factors, if any, uniquely predicted COMM scores.

3. Results

Table 1 contains mean scores from the COMM, BIS, and SSS for the sample. Scores on the COMM, the dependent measure, ranged from 0-37. COMM scores were transformed because of a significant Shapiro-Wilk test of normality. After a log transformation, transformed scores were normally distributed. Two-tailed Pearson correlations were performed to examine the association between COMM scores and the following: age, sex, race, ethnicity, BIS subscales, and SSS subscales. Results indicated that age ($r=-.33$, $p<.04$), BIS Attentional Impulsiveness ($r=.53$, $p<.001$), BIS Motor Impulsiveness ($r=.36$, $p<.02$), and BIS Non-planning Impulsiveness ($r=.38$, $p<.02$) were significantly associated with the COMM total score. There were no significant associations between the COMM and the SSS subscales – Disinhibition ($r=.26$, $p=.11$), Boredom Susceptibility ($r=.27$, $p=.09$), Thrill and Adventure Seeking ($r=.28$, $p=.08$), and Experience Seeking ($r=.27$, $p=.08$).

Next, a multivariate linear regression was performed to determine which variables associated with the COMM uniquely predicted opioid analgesic misuse risk. The three BIS subscales were significantly inter-correlated with one another, but not with age. Correlation coefficients ranged from $r=.31$ (Motor Impulsiveness and Non-planning Impulsiveness) to $r=.67$ (Attentional Impulsiveness and Non-planning Impulsiveness). Given the low to moderate inter-correlations, the three BIS subscales were used in the analysis. Variables were entered in two steps, age followed by BIS subscales, see Table 2. After controlling for age, the BIS subscales accounted for 29.0% of the variance in the COMM. Attentional Impulsiveness ($\beta=0.38$, $p=.04$) was the only significant BIS subscale.

4. Discussion

This pilot study explored whether impulsivity and sensation seeking are associated with opioid analgesic misuse risk in patients with chronic, low-back pain prescribed opioid analgesics. Our results indicate that greater impulsivity, as measured by the BIS, is associated with greater risk for misusing opioid analgesics. This is consistent with findings that opioid dependent individuals are more impulsive compared to controls (Kirby et al., 1999; Nielsen et al., 2012; Robles et al., 2011). In the present study, Attentional Impulsiveness is the only BIS subscale associated with risk while Non-planning and Motor Impulsiveness are not. In the BIS, Attentional Impulsiveness represents the extent of distractibility and cognitive control. While the relationship between impulsivity and misuse risk was positive, the nature of this relationship warrants additional investigation. Indeed, a chronic pain condition can lead to myriad factors that could affect attention, including pain interference, sleep difficulties, and stress. It is possible that the association identified in our study could be a valid link between impulsivity and risk or a reflection of other aspects of the chronic pain experience.

In contrast, sensation seeking does not appear to be associated with opioid analgesic misuse risk in this clinical population. While this is similar to reports in methadone patients (Nielsen et al., 2012) and in substance abusing women (Conrod et al., 2000), this is in contrast to other reports suggesting an association between sensation seeking and opioid dependent individuals (Andrucci et al., 1989; Franques et al., 2003; Kosten et al., 1994). However, our sample was not a substance abuse treatment population, which makes comparisons to these studies somewhat problematic.

There are some limitations in this pilot study. Impulsivity, sensation seeking, and opioid analgesic misuse risk were assessed by self-report questionnaires. As this study was correlational, we cannot determine causality. Exclusion of participants based on CPAQ scores and the small sample size limits the generalizability of these findings. Common to pilot research, the relatively small sample size limits statistical power and the breadth of our analyses. The results require replication in a larger sample. Finally, other factors that may be associated with opioid misuse risk were not included in the analyses because of sample size and availability (e.g., opioid dose and time in pain treatment).

Nonetheless, these findings in a non-substance abuse treatment population lay a framework for potentially identifying chronic pain patients at risk for misusing opioid analgesics. Impulsivity is not well characterized in chronic pain patients. Indeed, a review of the literature yielded no studies directly addressing impulsivity and chronic pain in risk for opioid analgesic misuse. As such, it may be a significant but overlooked risk factor for opioid analgesic misuse. This suggests a potentially important role for screening of personality traits, such as impulsivity, in chronic pain patients and subsequent close monitoring of those found to be at risk. This can potentially decrease patients' likelihood of developing an opioid use disorder.

In sum, these results, although preliminary, are promising and suggest the need for additional research in this area as they represent a potentially significant step in better understanding risk factors for opioid analgesic misuse. Given the relatively low overall impulsivity scores, the degree of impulsivity in chronic pain patients may be lower than is generally considered important in risk of use in a substance abusing population. Finally, we are not aware of other studies that have examined impulsivity and risk for opioid analgesic misuse in this novel and important clinical population.

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Highlights

- Impulsivity is associated with opioid analgesic misuse risk in chronic pain patients
- Sensation seeking is not associated with opioid analgesic misuse risk
- Impulsivity may be a risk factor for opioid misuse with direct clinical implication

Table 1

Demographics, opioid analgesic misuse risk, and impulsivity

Participant Characteristics (n=42)	Mean (SD) or n (%)
Sociodemographics	
Female	23 (54.8%)
Age	47.5 (10.1)
White	30 (71.4%)
Hispanic	20 (47.6%)
Years of education	12.6 (1.4)
Brief Pain Inventory (BPI)	
Pain severity	7.4 (1.6)
Pain interference	7.5 (1.9)
Current Opioid Misuse Measure (COMM)	
Total score	16.8 (11.3)
Barratt Impulsiveness Scale (BIS)	
Attentional Impulsiveness	17.4 (5.6)
Motor Impulsiveness	21.5 (3.7)
Nonplanning Impulsiveness	25.8 (5.5)
Sensation Seeking Scale (SSS)	
Disinhibition	3.0 (2.7)
Boredom Susceptibility	2.0 (1.4)
Thrill and Adventure Seeking	3.9 (3.3)
Experience Seeking	4.4 (2.0)

BPI: 0-10 point scale

COMM: 0-68 point scale

BIS: Attentional: 8-32; Motor, Nonplanning: 11-44 point scale

SSS: 0-10 point scale

Table 2

Linear regression: Predictors of opioid analgesic misuse risk

Predictors	β	$R^2\Delta$	Adj. R^2
Demographics			
Age	-.328 *	.108 *	
BIS subscales			
Attentional Impulsiveness	.379 *		
Motor Impulsiveness	.216		
Nonplanning Impulsiveness	.056	.290 **	.333 **

*
 $p < .05$ **
 $p < .01$