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Sleep disturbances and pain among individuals with prescription opioid dependence

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HIGHLIGHTS

- We examined sleep functioning in prescription opioid (PO) dependent individuals and controls.
- Subjective sleep quality was reportedly less for the PO group than controls.
- As measured by actigraphy, objective sleep quality was less for PO group on 4 of 6 measures.
- This significant sleep impairment indicates the need for close assessment and treatment.

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ABSTRACT

Background: Poor sleep quality has been observed in individuals with substance use disorders and is often a trigger for relapse. To date, little research has investigated sleep quality among individuals with prescription opioid (PO) dependence. The present study aimed to address this gap in the literature by examining subjective and objective sleep disturbances among PO dependent individuals.
Methods: Subjects were 68 non-treatment seeking individuals (33 PO dependent, 35 healthy controls). Subjective sleep was assessed with the Pittsburgh Sleep Quality Index (PSQI) and Insomnia Severity Index (ISI). Subjects were admitted for an overnight inpatient hospital stay during which objective sleep data was collected using an actigraphy device. Self-report pain was measured with the Brief Pain Inventory.
Results: Significant group differences in subjective sleep quality were revealed in the PSQI ($p < 0.01$) and ISI ($p < 0.01$). Poor sleep quality (i.e., PSQI total score > 5) was identified in 80.6% of the PO group, as compared to 8.8% of the control group ($p < .001$). Significant group differences in sleep quality were identified in five of six actigraphy variables: total time asleep, sleep efficiency, latency of onset of sleep, total time awake and time mobile. Furthermore, significant associations between pain severity and sleep quality were observed.
Conclusions: Results indicate high rates of sleep impairment and poor sleep quality among PO dependent individuals. Pain severity was significantly correlated with sleep quality. Although preliminary, the findings highlight the importance of assessing and treating sleep disturbances, as well as pain, among patients with PO dependence.

1. Introduction

The non-medical use of prescription opioids (PO) is a growing problem in the United States. Data from the National Survey on Drug Use and Health (NSDUH; $N = 55{,}279$) showed that 13.6% of respondents endorsed lifetime non-medical PO use and 5.1% endorsed non-medical use in the previous year (Back, Payne, Simpson, & Brady, 2010). Similarly, McCabe, Teter, Boyd, Knight, and Wechsler (2005) found a lifetime prevalence of 12% and past year prevalence of 7% in a nationally representative sample of college students ($N = 10{,}904$). Impairment in functioning across a variety of domains (e.g., medical, legal, occupational) is often evident among individuals with PO dependence (Miller, 2004). Additionally, the incidence of emergency room visits, overdoses and unintentional fatalities from non-medical PO misuse have increased significantly over the past two decades (Paulozzi, Budnitz, & Xi, 2006; Strassels, 2009).

Motives for non-medical PO use vary and a significant proportion of individuals report initiating PO use for pain management, but then subsequently using the medication for alternative reasons (Back, Lawson, Singleton, & Brady, 2011), such as to improve sleep (Rigg & Ibanez, 2010). Boyd, McCabe, Cranford, and Young (2006) showed in a sample of adolescents ($N = 1086$) that 12% had engaged in non-medical PO use in the previous year and that of those, over 10% were using POs to aid sleep. Among a sample of adult lifetime non-medical PO users ($N =$

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640) McCabe, Cranford, Boyd, and Teter (2007) found that 13.7% used POs to improve sleep.

Poor sleep quality has been observed in individuals with substance use disorders including alcohol (Brower, 2001), nicotine (Jaehne, Loessl, Bárkai, Riemann, & Hornyak, 2009), marijuana (Bolla et al., 2008), and heroin (Hsu et al., 2012) and often serves as a salient trigger for relapse such that substance users reporting poor sleep are at greater risk for relapse and sleep disturbance is predictive of treatment outcome (Bower & Perron, 2010; Wang & Teichtahl, 2007). Sleep problems can persist for weeks and months, and sometimes years, after substance use cessation (Brower, 2003; Peles, Schreiber, Hamburger, & Adelson, 2011). One study of 60 alcohol-dependent patients found that poor sleep, specifically sleep latency, was the best predictor of relapse after a 12-week inpatient program (Foster & Peters, 1999). In another study by Brower, Aldrich, Robinson, Zucker, and Greden (2001), 60% of alcohol-dependent patients with baseline insomnia had relapsed at 5-months post treatment, as compared to 30% of patients without baseline insomnia. Additionally, significantly higher rates of relapse were observed among patients who endorsed, as compared to those who did not endorse, using alcohol to self-medicate symptoms of insomnia (59.5% vs. 37.8%; Brower et al., 2001).

To date, the research investigating sleep among opioid users has focused on heroin users, primarily in methadone maintenance treatment (MMT) (Sharkey et al., 2011). Stein et al. (2004) reported that 83.9% of 225 MMT patients had Pittsburgh Sleep Quality Index (PSQI) scores indicating poor sleep quality (i.e., >5). In a study of opioid naïve individuals, sleep architecture was significantly altered after a single opioid medication administration, with participants evidencing increases in the percentage of time spent in light sleep stages, and a marked reduction in the percentage of time spent in deep sleep stages (Dimsdale, Norman, DeJardin, & Wallace, 2007). Multiple mechanisms of action leading to disturbed sleep in those abusing opioids have been theorized, including decreased REM sleep (Lydic & Baghdoyan, 2005), altered GABA functioning (Watson, Lydic, & Baghdoyan, 2007), and lowered levels of adenosine (Trksak et al., 2010). Though sleep has become a focus of substance use research, no known studies to date have utilized actigraphy with a group of current PO dependent individuals. An actigraphy device, usually a watch, collects data about body movement continuously while it is worn thus allowing computer programs to determine sleep–wake cycles (Martin & Hakim, 2011).

The present study aimed to expand the extant literature on the presence and characteristics of sleep impairment among individuals with PO dependence. Specifically, we examined subjective self-report measures as well as actigraphy data collected during an overnight hospital stay. We hypothesized that PO dependent individuals, in comparison to healthy controls, would demonstrate poorer sleep quality, as measured by subjective and objective assessments. In addition, associations between poor sleep quality and pain severity were assessed.

2. Methods

2.1. Participants

Participants ($N = 68$) were 33 non-treatment seeking individuals with current (i.e., past 6 months) PO dependence and 35 healthy controls participating in a larger study on stress, the hypothalamic–pituitary–adrenal (HPA) axis, and prescription opioids. Participants were recruited primarily through advertisements (e.g., newspapers, Craigslist) and were initially screened over the telephone for study eligibility. A total of 220 participants were invited to the in person baseline assessment. Of these, 70 continued in the study, 79 were deemed ineligible, and 71 dropped out.

Exclusion criteria for all participants included the following: pregnant or nursing; major medical or psychiatric conditions that could interfere with the HPA axis (e.g. depression, PTSD, significant hematological, endocrine, cardiovascular, pulmonary, renal, or neurological disease, including diabetes); use of antihypertensive medications, beta-blockers, synthetic glucocorticoid therapy, or treatment with other agents in the past month that may interfere with the HPA axis response; BMI ≥ 39; and younger than 18 years old. Exclusion criteria specific to the PO group included the use of methadone in the past three months and meeting DSM-IV criteria for current substance dependence on other substances. Individuals who met criteria for abuse on other substances had to identify PO as their primary drug of choice. Exclusion criteria specific to the control group included current or lifetime substance dependence (other than nicotine) and abuse (other than past alcohol abuse). No participants were taking sleep medications during the time of the study.

2.2. Procedure

Participants were informed about all study procedures and IRB-approved written informed consent was obtained before any study procedures occurred. Following a preliminary telephone screen, participants came into the office and completed a baseline visit to determine eligibility. The baseline visit consisted of a structured clinical interview to assess substance use disorders and comorbid psychiatric conditions, self-report measures assessing constructs related to opioid dependence including sleep, a urine drug screen and breathalyzer test, and a history and physical examination. Eligible participants (both PO and healthy controls) were scheduled for a one-night hospital stay at the Medical University of South Carolina (MUSC).

Prior to admission for the overnight stay, three days of abstinence from alcohol and other substances, including PO, as evidenced by self-report, breathalyzer, and urine drug screen, were required. Caffeine and nicotine during the three days prior to the overnight stay were allowed. Participants were admitted to the MUSC hospital at 2000 h the evening prior to testing to allow for the control of extraneous variables (e.g., sleep, caffeine intake) that could potentially affect stress reactivity. Opiate withdrawal symptoms were assessed at the time of hospital admission using the 10-item self-report Short Opiate Withdrawal Scale (SOWS; Gossop, 1990). Participants with a SOWS score indicating acute withdrawal were rescheduled. Cigarette smokers were provided with a nicotine patch upon admission. Twenty-four hour nicotine replacement therapy was maintained throughout the hospital stay (≥20 cigarettes/day = 21 mg patch; 10–19 cigarettes/day = 14 mg patch; 5–9 cigarettes/day = 7 mg patch). Participants were provided a standard breakfast at 0730 h and then escorted by research staff to laboratory for testing. The current study does not include data from the laboratory testing. Participants were compensated $50 for completing the assessment battery and $150 for completing the hospital overnight.

2.3. Measures

2.3.1. Demographic information

Relevant demographic information (e.g., age, gender, employment status) was assessed with a form created for the purposes of this study.

2.3.2. Substance use

Substance use disorders were assessed with the Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 2002). The Timeline Follow-Back (TLFB; Sobell & Sobell, 1992) was used to assess substance use (e.g., PO, heroin, alcohol, marijuana, and cocaine) in the one month prior to the baseline visit. For each substance assessed, two summary variables were generated: 1) percent days used during the past month, and 2) average amount of substance used per day. The Addiction Severity Index, Lite (ASI — Lite; McLellan, Cacciola, & Zanis, 1997) assessed areas of functioning impacted by substance use disorders: 1) medical status, 2) employment status, 3) alcohol use, 4) drug use, 5) legal status, 6) family/social status, and 7) psychiatric status. A recent review of subscale scores by Cacciola, Alterman, Habing,