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Sleep problems reported by patients entering opioid agonist treatment

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Abstract

Treatment-seeking opioid dependent individuals frequently report sleep-related problems (Dyer & White, 1997; Puigdollers et al., 2004). The present study provides a detailed assessment of sleep duration and quality in this population, including their effect on daily functioning and relationship to psychiatric severity and drug use. New admissions to opioid-agonist maintenance treatment (n = 113) completed a series of questionnaires to assess sleep functioning, psychiatric severity, and drug use due to sleep problems over the past 30-days. The results showed that study participants reported considerable sleep-related difficulties that had little effect on their appraisals of daily functioning. Nevertheless, sleep problems were associated with psychiatric distress, and those reporting substance use specifically to increase or decrease sleepiness endorsed more sleep problems and lower levels of daily functioning. Overall, these results replicate and extend previous work showing poor sleep functioning in this population, and show that sleep problems are associated with variables that often have an adverse impact on substance abuse treatment outcome.

Keywords

opioid dependence; sleep duration; sleep quality; substance abuse treatment; psychiatric distress

1. Introduction

Inadequate sleep duration and quality are commonly reported health problems. Approximately one third of the general population reports occasional sleep problems, and about 10% have chronic insomnia (Roth, 2005; Fullerton, 2006). Sleep difficulty is associated with high rates of physical illness, psychiatric disorders, accidents, health care service utilization, social network problems, and employment-related difficulties (Roth et al., 2006; Sateia & Pigeon, 2004; Ohayona & Roth, 2003; Tjepkema, 2005; Vosvick et al., 2004). Many people with sleep problems have a greater tendency to use both licit and illicit substances to attempt to improve sleep functioning (e.g., Crum, Ford, Storr & Chan, 2004; Johnson, Roehrs, Roth & Breslau, 1998).

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Sleep functioning also appears to be a common concern in opioid dependent individuals (e.g., Dyer & White, 1997; Puigdollers et al., 2004). While laboratory studies have shown that opioid induction, maintenance, and acute and protracted abstinence syndromes can affect sleep functioning (Wang & Teuchtahal, 2007), considerably less is known about the quality of sleep in individuals that are opioid dependent. Two studies using the Pittsburgh Sleep Quality Index (PQSI) to assess sleep in patients receiving long-term opioid agonist therapy (Stein et al., 2004; Peles, Schreiber & Adelson, 2006) found that most (75–83%) were rated as “poor sleepers,” and that poor sleepers reported higher levels of unemployment, drug use, psychiatric comorbidity, chronic pain, and bigger methadone doses.

The purpose of the present study is to provide more depth to the assessment of sleep problems in treatment-seeking opioid dependent individuals by evaluating multiple dimensions of sleep functioning and daytime sleepiness. The study also examines the relationship of sleep difficulties to current psychiatric symptoms, daily functioning and substance use. A sample of 113 opioid-dependent individuals reported on sleep function and factors related to sleep function over the past 30-days upon admission to an opioid-agonist maintenance treatment program. We hypothesized that this sample would report inadequate durations of sleep, poor quality of sleep, and daytime sleepiness, and that these aspects of sleep dysfunction would correlate with psychiatric severity and promote the reported use of licit and illicit substances to induce sleep.

2. Methods

2.1. Participants

Participants (n=113) in the present report were drawn from 170 opioid-dependent patients that were enrolled in a longitudinal evaluation of the efficacy of levo-alpha-acetylmethadol (LAAM) as a treatment induction and maintenance medication in combination with an adaptive stepped care treatment approach; all participants were admitted to the treatment program between January 1999 and May 2000. The majority of the patients excluded (53%; n=30/57) from this report were post-partum women referred to the treatment program from the Center for Addiction and Pregnancy. They were excluded for the following reasons: 1) while technically classified as new admissions to the program, they were all receiving a stable dose of methadone and treatment services for several months up to the day of transfer to our program. In contrast, all of the other admissions to the program were out-of-treatment at the time of admission to the program, though many of them had a history of methadone treatment. Additionally, all of these women were caring for newborns and this often disrupts routine sleep. The remaining 27 patients were excluded because of failure to complete the enrollment and intake assessment battery (n = 20) or because of cognitive impairment or other medical/psychiatric problems that required increased clinical attention (n = 7). All participants met DSM-III-R criteria for opioid dependence and Food and Drug Administration requirements for opioid agonist maintenance, and all provided written informed consent. The parent study was approved by the Johns Hopkins Bayview Institutional Review Board.

2.2. Study Assessments

Addiction Severity Index (ASI – 5th Edition; McLellan et al., 1992)—The ASI provides information on the number of self-reported days of drug and alcohol use over the past 30-days and problem severity scores in seven areas commonly affected by substance use disorder: medical, employment, drug, alcohol, legal, family/social, and psychiatric problem severity. The ASI has both good and well-established validity and reliability (McLellan, Cacciola, Alterman, Rikoon, & Carise, 2006), and was administered in the present study by research staff who completed an intensive two-step training procedure (for details of training procedure: see Brooner, King, Kidorf, Schmidt & Bigelow, 1997).

Medical Outcomes Study Sleep Questionnaire (MOS; Hays & Stewart, 1992)—

The MOS is a 12-item, self-report assessment of sleep functioning over the past month that has been used across a variety of clinical populations (Hays, Martin, Sesti, & Spritzer, 2005; Xu, Brandenburg, McDermott & Bazil, 2006; Zelman, Brandenburg & Gore, 2006). Items assessing sleep initiation (i.e., “How long did it usually take for you to fall asleep during the last month?”) and sleep duration (i.e., “On the average, how many hours did you sleep each night during the past month?”) use time range estimates, while the remaining 10 items (e.g., “How often did you feel that your sleep was not quiet?” “How often did you get enough sleep to feel rested upon waking in the morning?”) use a 6-point Likert scale (“none of the time” to “all of the time”). Seven subscales are derived from these items: Sleep quantity, Sleep disturbance, Snoring, Sleep short of breath, Sleep adequacy, Sleep somnolence, and an overall Sleep problems index. The psychometric properties of these scales were derived using a nationally representative sample of United States adult males and females ($n = 1011$; Hays & Stewart, 1992; Hays et al., 2005). Internal consistency reliability estimates were 0.73 or higher, with the exception of the Sleep somnolence scale ($\alpha = 0.63$).

Epworth Sleepiness Scale (ESS; Johns, 1991)—The ESS is an 8-item questionnaire that measures self-reported daytime sleepiness across common situations (e.g., sitting and reading, watching TV, sitting and talking to someone), thereby emphasizing behavior rather than subjective feelings. Scores range from 0 (low sleepiness) to 24 (high sleepiness), with scores of ≥ 10 indicative of excessive daytime sleepiness (Banerjee, 2007). General population normative scores for the ESS were derived from a small sample of non-sleep disordered individuals ($n = 30$, $M = 5.9$, $SD = 2.2$; Johns 1991), although similar values have been reported in other studies using larger general population samples ($n = 72$, $M = 4.6$, $SD = 2.8$, Johns and Hocking, 1998; $n = 188$, $M = 4.5$, $SD = 2.2$, Chen, Clift, Dahlitz, Dunn & Parkes, 1995). The scale has demonstrated good internal consistency ($\alpha \geq .73$) and retest reliability ($r = 0.81$), and is highly correlated with partner/observer ratings ($r_s = .74$). The ESS has also detected changes in daytime sleepiness resulting from both pharmacological and behavioral sleep interventions (Johns, 1998).

Functional Outcomes of Sleep Questionnaire (FOSQ; Weaver et al., 1997)—The FOSQ is a 30-item self-report measure of the impact of sleep dysfunction on daily activities. Each item is answered using a four-point Likert scale (“no difficulty” to “yes, extreme difficulty”), with a “not applicable” option for some activities (e.g., effects on relationship when not in a relationship). The measure produces five subscales: Activity level, Vigilance, Intimacy/sexual relationships, General productivity, and Social outcome. Subscale scores range from 1–4, with higher values signifying more dysfunction due to sleep problems, and a total score derived by summing all of the subscale scores. The subscales have demonstrated good internal consistency ($\alpha \geq .86$) and retest reliability ($r \geq .81$; Weaver et al., 1997). The sample size for analyses in the present study involving the FOSQ subscales is variable because some items were not applicable to all participants (e.g., relationship difficulties).

We added to this measure six questions about the use of licit and illicit drug over the past 30-days for the specific purpose of increasing or decreasing sleepiness. The questions used the following format: “Have you ever used (legal medications, alcohol/caffeine, illegal drugs) to help you (sleep/stay awake)?” Participants responded to each question using a 6-point Likert scale (“never,” “rarely,” “sometimes,” “often,” “usually,” and “always”). To facilitate analysis and interpretation, the six questions were ultimately collapsed to create two dichotomous variables: 1) any reported substance use to increase sleepiness, and 2) any reported substance use to decrease sleepiness.

3. Results

3.1 Sample characteristics

Participants had a mean age of 36.2 years ($SD = 8.1$), and were largely female (80%) and minority (76%). The sample was largely unemployed (82%), 46% had less than 12 years of education, and 66% were unmarried. Participants reported an average of 9.2 years ($SD = 6.6$) of regular heroin use and 3.5 years ($SD = 4.9$) of regular cocaine use prior to the baseline assessment. The demographic and clinical characteristics of this sample are similar to those reported in other recent studies examining treatment-seeking opioid-dependent patients in Baltimore, with the exception of the high proportion of females (e.g., Carroll, Kidorf, Strain & Brooner, in press). All participants also reported using an opioid on each of the past 30-days, 76% reported daily use of heroin, and 67% reported at least one day of cocaine use (range = 1–30 days; median = 2 days in the past 30). Self-reported rates of alcohol and sedative use over the preceding 30-days were considerably lower. The vast majority (92%) of subjects reported using sedatives on fewer than 4 of the past 30-days and 71% reported using alcohol on less than 4-days.

3.2. Sleep problems

One sample t-tests evaluated mean differences between sleep measure scores (MOS; ESS) in the present study and available normative data drawn from general population samples to provide context for overall scores and subscales (normative data was not available for the FOSQ). Considerable problems with sleep were reported across several dimensions of the MOS and ESS. Participants reported more sleep difficulty on most subscales of the MOS and more sleepiness on the ESS than the normative samples (see Table 1). Responses to the FOSQ indicated low self-reported levels of dysfunction in daily living due to sleepiness (Total score = 7.4 ($SD = 2.7$); General productivity = 1.4 ($SD = 0.5$); Social outcome = 1.4 ($SD = 0.6$); Activity level = 1.7 ($SD = 0.6$); Vigilance = 1.5 ($SD = 0.6$); Intimate relationships = 1.5 ($SD = 0.7$)).

3.3. Psychiatric severity and sleep problems

A series of Spearman correlation analyses were conducted between each of the seven ASI severity scores and the MOS, ESS, and FOSQ. ASI psychiatric severity scores positively correlated with five subscales of the MOS: Sleep problems ($r_s = 0.38$, $p < .001$), Sleep disturbance ($r_s = 0.30$, $p < .001$), Sleep somnolence ($r_s = 0.33$, $p < .001$), Sleep shortness of breath ($r_s = 0.30$, $p < .001$), and Sleep adequacy ($r_s = -0.14$, $p < .05$). Psychiatric severity was also positively correlated with the ESS ($r_s = 0.38$, $p < .001$), and with the total score and five subscales of the FOSQ: Total score ($r_s = 0.25$, $p < .001$), General productivity ($r_s = 0.20$, $p < .05$), Social outcome ($r_s = 0.27$, $p < .01$), Activity level ($r_s = 0.24$, $p < .01$), Vigilance ($r_s = 0.31$, $p < .001$), and Intimate relationships ($r_s = 0.21$, $p < .05$). The other ASI composite severity scores were not associated with sleep problems.

3.4. Substance use and sleep problems

The proportions of participants using substances to increase sleepiness over the past 30-days are: use of Illegal substances (“any” use: 80%; “often or more” use: 58%); use of alcohol (“any” use: 29%; “often or more” use: 3%); and use of licit medication (“any” use: 44%; “often or more” use: 16%). In contrast, the proportions of participants reporting use of substances to decrease sleepiness are: use of Illegal substances (“any” use: 48%; “often or more” use: 20%); use of coffee, tea, or soda (“any” use: 47%; “often or more” use: 14%); and use of licit medication (“any” use: 20%; “often or more” use: 4%).

Analyses of variance (ANOVAs) were used to compare MOS, EPSS, and FOSQ responses across participants categorized into three groups based on their use of substances to modify sleep functioning: substance use to increase and decrease sleepiness ($n = 71$); substance use to increase sleepiness ($n = 28$), or no substance use to increase or decrease sleepiness ($n = 10$). The small subgroup of participants reporting use of substances only to decrease sleepiness ($n = 9$) was excluded from these analyses. Supplemental analyses (not shown) revealed that the exclusion of these participants did not affect the overall pattern of results. Tukey's HSD post hoc analyses explored specific condition differences following detection of main effects. As shown in Table 2, participants reporting the use of substances to both increase and decrease sleepiness in general reported more sleep problems than those in the other two study groups.

4. Discussion

4.1. Sleep problems and appraisals of daily functioning

As expected, study participants reported a considerable breadth of sleep-related problems, replicating and expanding previous findings of studies using global scores derived from a single measure of sleep functioning (Peles et al., 2006; Stein et al., 2004; Wang et al., 2005). That this sample largely denied any degradation of daily functioning on the FOSQ dovetails with laboratory studies using general population samples that have manipulated sleep dose and found that those with partial sleep deprivation are often unaware of subsequent cognitive impairment (Van Dongen, Maislin, Mullington & Dinges, 2003). It may be that the FOSQ and other measures of daily functioning are not sufficiently sensitive to assess cognitive or behavioral consequences of chronic sleep problems. It is also possible that study participants had behaviorally adapted to high levels of impairment related to sleep difficulties, drug use, and other psychosocial and medical problems that are common in treatment-seeking substance abusers (e.g., Durmer & Dinges, 2005).

4.2. Sleep problems and psychiatric severity

Sleep problems in the present sample were positively correlated with psychiatric distress, thereby supporting results from previous studies of substance users and other populations (Roth et al., 2004; Peles et al., 2006). It is possible that for some patients the report of sleep dysfunction was symptomatic of an untreated or partially treated psychiatric syndrome (e.g., major depression; generalized anxiety disorder). Psychiatric disorders are quite prevalent in this population (Brooner et al., 1997). The association between psychiatric severity and sleep problems may also be a function of poor coping to stressful events, even in the absence of a comorbid psychiatric disorder (Tjepkema, 2005). Treatment-seeking substance users often report high levels of distress upon admission to treatment (Strain, Stitzer & Bigelow, 1991).

4.3. Substance use to increase or decrease sleepiness

Most participants (> 90%) reported using substances to either increase **or** decrease sleepiness, a finding that has been repeatedly noted in studies reporting on general population (Johnson et al., 1998) and substance abusing samples (Smith & Wesson, 2004) samples. These findings are also consistent with reports that sleep problems and insomnia are strong predictors of relapse in people with alcohol and other substance use disorders (e.g., Brower, Aldrich, Robinson, Zucker & Greden, 2001). In the present study, those who reported using drugs to increase and decrease sleepiness also reported more sleep-related problems and greater functional impairment, indicating that scope and magnitude of sleep-related problems may index higher rates of drug use severity. At the very least, including an assessment of substances that patients report taking to alter sleep related problems is clearly warranted by this and other studies. Many of these drugs (e.g., benzodiazepines, alcohol) have high abuse liability and are associated with serious and sometimes life-threatening withdrawal syndromes (Dickinson, Mayo-Smith & Eickelberg, 2003), and there is the distinct possibility that the drug use may

remain even after the sleep problem has resolved. On a more positive note, it may be easier for patients to acknowledge the presence and severity of the use of these drugs when the assessment is associated with the high rates of sleep problems reported in people with substance use disorder.

4.4. Study limitations

The primary limitations of this study are those found in other studies relying on self-report data (Teplin, Raz, Daiter, Varenbut & Tyrrell, 2006). It is not unusual for individuals to misreport quantity and quality of sleep (Means, Edinger, Glenn & Fins, 2003), and treatment-seeking patients often attribute drug use to a number of states and situations, of which sleep-related problems is just one of them. Nevertheless, the results generally dovetail with those of other studies using similar methodologies, and provide additional evidence for the breadth of sleep problems in this population and its relationship to psychiatric distress and drug use. Another study limitation is that levels of sleep dysfunction were compared to normative data derived from general population samples that were not matched to the study sample on age, gender, race, or other characteristics that might independently affect sleep functioning. That study participants often attained two-fold increases on sleep-related measurements compared to normative data provides more confidence in the magnitude of sleep problems experienced by this sample of drug users. The relatively small sample and low rates of self-reported number of days of alcohol and sedative use did not permit any meaningful statistical analyses evaluating the effects of these drugs on sleep functioning. Finally, sleep difficulties observed at the onset of treatment may change over the course of care, growing worse or better in relation to changes in drug use and associated psychiatric and psychosocial stressors. Future work might identify which patients are likely to persist in reporting sleep problems and require more carefully targeted treatment interventions (e.g., Currie, Clark, Hodgins & el-Guebaly, 2004).

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Table 1

Reported sleep problems and general population scale norms.

Sleep Measure	Total Sample (N=113)	Normative Sample	One sample T test	p
<i>Medical Outcomes Study Sleep Measure^a</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>T (df)</i>	
Sleep Problems Index	50 (17)	29 (18)	12.8 (112)	<.001
Sleep Disturbance	59 (24)	29 (23)	13.2 (112)	<.001
Sleep Somnolence	36 (25)	26 (20)	4.3 (112)	<.001
Sleep Short of Breath	26 (31)	13 (22)	4.7 (111)	<.001
Snoring	35 (38)	31 (30)	1.0 (109)	ns
Hours slept each night	6.3 (2.6)	6.9 (1.4)	-2.6 (112)	<.05
Sleep Adequacy	39 (25)	61 (25)	-9.3 (112)	<.001
<i>Epworth Sleepiness Scale^b</i>	7.8 (5.2)	5.9 (2.2)	3.9 (112)	<.001

^a Normative sample from Hays & Stewart (1992). This measure is missing 0–3 participants per scale.

^b Normative sample from Johns (1991).

Table 2
Relationship between the use of substances to modify sleepiness and reported sleep problems

	Substance use to increase & decrease sleepiness (n=71)	Substance use to increase sleepiness (n=28)	No substance use to increase or decrease sleepiness(n=10)	F	p *
Medical Outcomes Study Sleep Measure					
Sleep Problems Index	M (SD) 54 ^b (17)	M (SD) 44 ^b (15)	M (SD) 34 ^a (18)	8.6	<.001
Sleep Disturbance	63 ^b (24)	56 ^b (24)	38 ^a (17)	5.2	<.01
Sleep Somnolence	43 ^b (24)	25 ^b (24)	17 ^a (11)	9.6	<.001
Sleep Short of Breath	31 ^b (30)	14 ^a (26)	20 (34)	3.7	<.05
Snoring	31 (36)	38 (43)	38 (43)	0.3	ns
Hours slept each night	6.3 (2.8)	6.2 (2.0)	6.7 (1.9)	0.1	ns
Sleep Adequacy	36 (23)	38 (24)	47 (33)	0.8	ns
Epworth Sleepiness Scale	8.9 ^b (4.9)	5.6 ^a (4.0)	4.1 (4.8)	8.0	<.001
Functional Outcomes of Sleep Questionnaire[†]					
Total score	8.4 ^b (2.9)	5.9 ^a (1.4)	5.1 ^a (0.4)	15.1	<.001
General Productivity	1.6 ^b (.55)	1.2 ^a (.27)	1.0 ^a (0.0)	11.2	<.001
Social Outcome	1.6 ^b (.69)	1.1 ^a (.25)	1.0 ^a (0.0)	9.0	<.001
Activity Level	1.9 ^b (.68)	1.4 ^a (.35)	1.1 ^a (.11)	11.9	<.001
Vigilance	1.7 ^b (.64)	1.2 ^a (.36)	1.1 ^a (.15)	6.9	<.01
Intimate Relationships	1.7 ^b (.79)	1.2 ^a (.34)	1.0 ^a (.08)	10.7	<.001

* Significant F tests followed by Tukey's post-hoc comparisons, with different letters denoting significant condition differences.

This measure is missing 0–3 participants per scale.

[†] This measure is missing 0–9 participants per scale, due to “not applicable” responses.