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Pain and sleep-wake disturbances in adolescents with depressive disorders

Caitlin B. Murray[1], **Lexa K. Murphy**[2], **Tonya M. Palermo**[2,3], and **Gregory M. Clarke**[4]

[1]Loyola University of Chicago

[2]Seattle Children's Research Institute

[3]University of Washington School of Medicine

[4]Kaiser Permanente Center for Health Research

Abstract

Objective—The aims of this study were to: 1) assess and compare sleep disturbances (including daytime and nighttime sleep patterns) in adolescents with depressive disorders and healthy peers, 2) examine the prevalence of pain in adolescents with depressive disorders and healthy peers, and 3) examine pubertal development, pain intensity and depressive symptom severity as predictors of sleep disturbance.

Method—One hundred and six adolescents (46 depressed; 60 healthy), 12-18 years (M = 15.10 years; 67% female; 77% Caucasian) completed subjective measures of sleep, pre-sleep arousal, fatigue and pain. Participants also underwent ten days of actigraphic monitoring to assess nighttime and daytime sleep duration, sleep efficiency, and wake after sleep onset.

Results—Results indicated that youth with depression exhibited greater sleep disturbances on subjective and actigraphic sleep variables than healthy controls. Depressed youth also reported more frequent and severe pain than healthy youth. Linear regression analysis indicated that pain intensity and depressive symptoms predicted worse sleep quality across groups. The interaction term was also significant, such that adolescents with high levels of depressive symptoms had poor sleep quality when pain intensity levels were high.

Conclusions—These results indicate that sleep is important to assess in youth with depression, and that pain may be an important target for sleep intervention in this population.

Keywords

Depression; adolescents; sleep; pain; actigraphy

Sleep-wake disturbances are often associated with psychiatric comorbidity in children and adolescents. In particular, more than 90% of children and adolescents with depressive disorders report sleep problems (Ryan et al., 1987). Sleep in youth with depressive disorders is of particular importance, as studies indicate sleep disturbances are associated with longer depressive episodes, more severe symptomatology, and greater risk of suicide completion (Goldstein, Bridge, & Brent, 2008; Liu et al., 2007). However, few studies have comprehensively assessed sleep disturbances in adolescents with depressive disorders.

Previous research has found that on self-report, youth with depression frequently complain of insomnia symptoms, such as difficulty falling asleep and maintaining sleep (Dahl et al., 1996). A recent study suggested that up to 53% of adolescents with depression meet diagnostic criteria for insomnia (Liu, et al., 2007). In the limited number of studies investigating sleep hygiene (e.g., sleep inhibiting/facilitating practices) in adolescents with

depression, findings have demonstrated that youth with depression go to bed later despite early school start times (Gangwisch et al., 2010), and consume more caffeine compared to healthy samples (Whalen et al., 2008). A few studies have used actigraphy (a measure of motion used as a proxy for sleep) finding some evidence of sleep onset and circadian rhythm abnormalities in this population (Armitage et al., 2004; Dahl, et al., 1996). For example, one study using both EEG and actigraphic measures revealed prolonged sleep latency in adolescents with depression (Dahl, et al., 1996). Other characteristics of sleep such as fatigue and daytime sleep patterns (e.g., napping) have not yet been described in youth although identified as important in adults with depression (Foley et al., 2007).

A limited number of studies have investigated clinical factors that may be associated with sleep disturbance in adolescents with depression beyond depression severity (Liu, et al., 2007). One possible modifiable factor related to sleep disturbances in this population is somatic symptoms, particularly recurrent aches and pains. Previous studies have demonstrated high rates of comorbidity of pain complaints and depression among clinical and non-clinical samples (Campo et al., 2004; Pine, Cohen, & Brook, 1996). For example, in a study of adolescents with depression, Egger et al. (1999) found that youth with depression reported 10 to 13 times more musculoskeletal and stomach pains compared to an age- and sex-matched healthy cohort. Pain has been shown to have deleterious effects on adolescent sleep (Ohayon, 2005; Palermo, Wilson, Lewandowski, Toliver-Sokol, & Murray, 2011), yet this association has not been explored in adolescents with depressive disorders. Additionally, because some studies have indicated that biological processes underlying puberty may influence sleep patterns in adolescents (Carskadon, Vieira, & Acebo, 1993), pubertal development may also be an important determinant of sleep in depressed youth.

Therefore, we conducted this study to provide a comprehensive examination of daytime and nighttime sleep patterns and characteristics in adolescents with depressive disorders in comparison to same age healthy peers. We hypothesized that adolescents with depressive disorders would have more nighttime sleep disturbances and altered daytime sleep and fatigue as determined by actigraphy and subjective measures compared to healthy youth. We expected that adolescents with depression would experience more frequent and intense pain compared to their healthy peers. Finally, we expected that more advanced pubertal development, increased pain intensity, and greater depressive symptoms would predict worse sleep quality across both groups.

Method

Participants

Participants in the depression group were recruited from a pool of adolescents participating in an ongoing depression study at a medical center in the northwest U.S., or were identified from a pharmacy database indicating the use of antidepressants for a depressive disorder at this same medical center. Interested participants were screened by phone or in person by a member of the research team and were invited to participate in the study if they met the following criteria: (a) ages 12 to 18 years, (b) currently diagnosed major depression (MDD) or depressive disorder not otherwise specified (DNOS) using the Schedule for Affective Disorders for School-Age Children (K-SADS), (c) a score of 16 or above for males and 20 or above for females on the Center for Epidemiologic Studies Depression (CES-D) Scale, and (d) the ability to read and understand English. Exclusion criteria were (a) history of schizophrenia, acute psychotic disorders, or biopolar disorder I or II, (b) any serious comorbid chronic health condition (e.g., cancer), and (c) intellectual developmental disability. Of the 214 participants in the depression group who were screened, 134 were excluded due to ineligibility, 34 declined, and 46 were enrolled. The most common reason for ineligibility was absence of a currently diagnosed depressive disorder.

The healthy comparison group was recruited via advertisements for the study. Inclusion criteria were: (a) 12 to 18 years of age; (b) absence of depression according to CES-D cutoff and K-SADS; (c) absence of a serious chronic medical condition, a behavioral/emotional disorder, or developmental disability; (d) not currently receiving treatment for a sleep disorder; and (e) fluency in English. Of the 107 healthy participants who were screened, 41 were excluded due to ineligibility, six declined, and 60 were enrolled. The most common reason for ineligibility was diagnosis/current treatment of a behavioral/emotional disorder.

Procedure

The sponsoring institutions' Institutional Review Boards approved this study. After assessing for eligibility over the phone, written consent was obtained from caregivers and adolescents aged 18, and written assent was obtained from adolescents ages 12-17. All adolescents completed assessment batteries, described below. Parents completed a demographics form. Participants received gift certificates to local stores after completing study procedures. Parents and adolescents from both groups underwent a psychiatric interview (Children's Schedule for Affective Disorders and Schizophrenia present version [K-SADS-P]; depression, mania, psychosis, and PTSD supplements; Kaufman et al., 1997) with a member of the research team assessing adolescents' symptoms. Adolescents from both groups also completed a 10-day sleep assessment, which included actigraphy monitoring and an electronic daily sleep diary. The electronic sleep diary, completed on a Personal Digital Assistant (PDA), was used to provide self-report of sleep and to assist with actigraphy scoring (e.g., verifying records when the actiwatch was removed, daytime naps, etc.). The sleep diary included questions about bedtimes, wake times, and the frequency and duration of naps. Sleep assessment equipment was returned to study staff at the completion of the 10-day period via mail.

Measures

Demographics—Caregivers completed a demographics form assessing their adolescent's age, gender, race, and ethnicity, as well as their household income.

Pubertal development—Adolescent report of pubertal status was measured with the Pubertal Development Scale (PDS) (Petersen, Crockett, Richards, & Boxer, 1988). Responses on this 8-item measure range from 1 to 4 and are scored and categorized such that higher scores indicate more advanced pubertal status. Internal consistency in the current sample was adequate (α =.75 and .65 for boys and girls, respectively).

Depression—Depression was assessed using both a structured diagnostic interview (K-SADS) and a symptom questionnaire. The K-SADS is a semi-structured DSM-IV-based diagnostic interview to establish that the participant met criteria for major depression or depression not otherwise specified (DNOS). The K-SADS has shown excellent test-retest reliability and validity (Kaufman et al., 1997). Additionally, adolescents reported depressive symptoms in the past week using the Center for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977). The CES-D is scored by summing all items for a total score (0-60). Higher scores on this measure indicate more depressive symptoms. The CES-D has demonstrated adequate test-retest reliability as well as validity (Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000; Radloff, 1977). The internal consistency in the current sample was good (α = .83).

Pain—Using a body diagram, adolescents marked all locations where they experienced pain during the past three months, and indicated the location they most frequently experienced pain. Adolescents also rated their usual pain intensity, frequency, duration and location in the past three months. Pain intensity was assessed with an 11-point Numerical Rating Scale

(0 = no pain to 10 = worst pain possible), which has demonstrated adequate reliability and validity in children and adolescents (von Baeyer, 2009). Pain frequency was rated on a 7-point scale (0 = not at all to 6 = daily) and pain duration was rated on a 4-point scale (1 = less than an hour to 4 = all day).

Sleep and Fatigue Characteristics

Actigraphic Measures: The Actiwatch 64 (Phillips Respironics) was used to assess sleep patterns. The actiwatch is a wristwatch-like device that records sleep-wake patterns by monitoring movement (or lack of movement). Previous research indicates that at least five nights of actigraphy recording are necessary to obtain reliable sleep measures (Acebo et al., 1999). Participants in this study were asked to wear the Actiwatch continuously for ten consecutive days and wore it for an average of 9.33 days, (SD = 1.71).

Sleep measures obtained from actigraphy monitoring included: (1) total sleep time or the total amount of sleep in minutes each participant received from sleep onset to offset; (2) wake minutes after sleep onset (WASO), the total number of minutes adolescents were awake from sleep onset to offset; (3) sleep efficiency or the ratio of estimated total sleep time and total time spent in bed (expressed as a percentage) with values closer to 100 representing good sleep efficiency; and (4) daytime sleep duration (e.g., naps). Information about nap duration and number of adolescents who napped during their assessment was drawn from daytime actigraphy data and verified with electronic diary reports. Mean nap durations were calculated by averaging all naps across the assessment period. Nap data was coded only if present in daytime actigraphy data and confirmed in adolescents' sleep diaries. All actigraphic sleep variables were averaged over each participant's total assessment period.

Subjective Measures

Sleep Quality—Sleep quality was assessed with the Adolescent Sleep Wake Scale (ASWS; (LeBourgeois, Giannotti, Cortesi, Wolfson, & Harsh, 2005). The ASWS is a 32-item self-report scale that assesses perceived quality of sleep in five behavioral dimensions: going to bed, falling asleep, maintaining sleep, reinitiating sleep, and returning to wakefulness. Items assess the occurrence and frequency of various sleep behaviors in the past month along a 6-point scale (1 = never to 6 = always) with higher scores indicating better sleep quality. The internal consistency in the current sample was good (α = .81).

Insomnia—Insomnia was assessed with two items drawn from the ASWS: difficulty falling asleep (“I have trouble going to sleep”) and difficulty maintaining sleep (“After waking up during the night, I have trouble going back to sleep”). If adolescents responded “quite often,” “frequently, if not always,” or “always” to either one of these questions (indicating that this occurred > 60% of the time), they were considered to have insomnia symptoms. Thus, presence of insomnia symptoms (yes/no) was coded as a dichotomous variable. These criteria have been used in previous studies in adolescent populations (Palermo, Toliver-Sokol, Fonareva, & Koh, 2007; Palermo, et al., 2011).

Pre-sleep arousal—Adolescents reported pre-sleep arousal on the 16-item Pre-Sleep Arousal Scale (PSAS) (Nicassio, Mendlowitz, Fussell, & Petras, 1985) which measures the presence and intensity of somatic and cognitive arousal experienced prior to sleep onset during a typical week. Responses are scored using a 5-point scale (1 = not at all to 5 = extremely), with higher scores indicating greater arousal before bedtime. Somatic arousal was assessed with questions pertaining to somatic symptoms (i.e., tense muscles, cold extremities, heart palpitations) prior to sleep onset. Cognitive arousal was assessed with questions pertaining to worry, anxiety, and racing thoughts at bedtime. Adequate internal consistency has been established and test-retest reliability has been reported in healthy

adolescents (Gregory, Willis, Wiggs, & Harvey, 2008). In this study, we used a slightly modified version used previously in work with adolescents (Palermo, et al., 2007; Palermo, et al., 2011). Reliability was excellent for the total scale in the current sample (α = .91).

Sleep Hygiene—Sleep hygiene was measured with the Adolescent Sleep Hygiene Scale (ASHS) (LeBourgeois, et al., 2005). The ASHS is a 24-item self-report scale that assesses sleep-facilitating and sleep-inhibiting practices in six conceptual dimensions: physiological (e.g., being very active one hour before bedtime), cognitive (e.g., doing things in bed like watching TV and reading), emotional (e.g., worrying about things happening at home or at school in bed), sleep environment (e.g., falling asleep in a brightly lit room), substances (e.g., having drinks with caffeine in the evening), and sleep stability (e.g., staying up more than one hour past usual bedtime). Items are scored on a 6-point scale (1 = always to 6 = never), with higher scores indicating better sleep hygiene. The ASHS has shown good internal consistency with adolescent populations (LeBourgeois, et al., 2005); and was also high in the current sample (α = .80).

Fatigue—Fatigue was assessed via adolescent self-report with the PedsQL Multidimensional Fatigue scale (Varni, Burwinkle, & Szer, 2004). This is an 18-item scale designed to assess the presence and severity of fatigue over the past month along three domains: general fatigue, sleep/rest fatigue, and cognitive fatigue. Responses are on a five-point scale (0 = never to 4 = almost always), with higher scores indicating fewer difficulties with fatigue. This scale has demonstrated excellent reliability and validity with children and adolescents (Varni, et al., 2004); the reliability in the current sample was also excellent (α = .95).

Data Analysis

All analyses were conducted with SPSS v 19.0. T-tests, MANOVAs, and chi-squared analyses were conducted to test differences in sociodemographic characteristics, pain characteristics, fatigue and sleep variables between groups. Partial η^2 was computed to determine effect sizes and interpreted using Cohen's guidelines (> 0.2 = large, > 0.1 = medium, > 0.05 small). A linear regression was conducted to test clinical predictors of sleep disturbance. Because sleep quality was highly correlated with pain intensity and depression severity (p's < .05), this sleep variable was selected over alternative sleep variables in the final regression model. None of the actigraphic sleep variables were significantly related to pain intensity. Several other covariates were examined (e.g., gender, age, use of prescription medication), however these variables were not significantly correlated with any sleep variables and thus were not included in subsequent analyses.

Results

Description of the samples

A total of 106 youth (n = 46 depression group, n = 60 healthy group), ages 12-18 (M = 15.10, SD = 1.76) participated in this study. The majority of participants were female (67.0%), Caucasian (77.4%), and from middle class households. Chi-squared and t-test analyses indicated no differences in age, gender, ethnicity, race, family income, or pubertal status between the two groups. The majority of the total sample (86.7%) was at the mid- or post-pubertal stage of development. See Table 1 for additional descriptive data (e.g., depression severity and diagnoses).

Group differences in sleep and fatigue characteristics

Actigraphic Measures—The two groups significantly differed on all actigraphic sleep values (Wilks' lambda = .76, $F(6, 93) = 4.98$, $p < .001$); these were small effect sizes (partial

η^2's 0.04 – 0.07), see Table 2. The depression cohort slept significantly less than the healthy group, $p = .03$. Adolescents with depressive disorders also had significantly lower sleep efficiency scores and higher WASO scores compared to the healthy cohort ($p < .01$ and $p < .05$, respectively). Half of the depression group took at least one nap during the assessment period and similarly, 38.3% of the healthy group took at least one nap ($p = .10$). However, on average adolescents with depression spent more time napping compared to the healthy sample ($p < .01$).

Subjective Measures—Compared to healthy peers, adolescents with depression self-reported poorer sleep including worse sleep hygiene (Wilks' lambda = .63, $F(6,96) = 9.45$, $p < .001$), poorer sleep quality (Wilks' lambda = .63, $F(5,98) = 11.40$, $p < .001$), higher pre-sleep arousal (Wilks' lambda = .56, $F(2, 101) = 40.28$, $p < .001$), and more difficulties with fatigue (Wilks' lambda = .46, $F(3,100) = 39.61$, $p < .001$). The effect sizes for total scales were large (partial η^2's 0.24 to .52). Insomnia was significantly more common in adolescents with depression (72.7 %) compared to healthy adolescents (22.0%; $\chi^2 = 21.94$, $p < .001$).

Group differences in pain

Adolescents with depression reported experiencing pain in multiple locations, most commonly the head and extremities (e.g., leg pain). These aches and pains were higher intensity ($t(103) = 4.03$, $p < .001$), occurred more frequently ($t(102) = 4.23$, $p < .001$) and lasted for longer time periods ($t(101) = 2.61$, $p < .01$) in youth with depression compared to healthy youth (see Table 3). The majority of the depression sample (58.7%) reported pain occurring at least two to three times per week over the previous three months, compared to 23.3% of the healthy sample.

Clinical predictors of sleep quality

The linear regression model accounted for 44% of the variance in sleep quality ($F(4,93) = 8.25$, $p < .001$). Higher pain intensity ($\beta = -0.09$, $p < .05$) and greater depressive symptoms ($\beta = -0.04$, $p < .001$) predicted worse sleep quality across both groups. The interaction term was also significant ($\beta = -0.01$, $p = .05$). Simple slope tests revealed that adolescents with high levels of depressive symptoms (+1 SD) had poor sleep quality when pain intensity levels were high (+1 SD).

Discussion

While previous studies have found discrepancies between subjective and objective measures of sleep disturbance in depressed youth (e.g., Bertocci et al., 2005), the results of this study indicate deficits in sleep both subjectively and actigraphically. Actigraphy data indicated lower sleep efficiency, more time awake after sleep onset, and reduced total sleep time in youth with depression. Moreover, subjective sleep data demonstrated that 72.7% of adolescents in the depression group reported insomnia symptoms, slightly higher rates than those found in previous studies of youth with depression (Liu, et al., 2007; Yorbik, Birmaher, Axelson, Williamson, & Ryan, 2004).

Sleep represents an important domain of current research in adolescents with depressive disorders, yet few studies have investigated possible modifiable factors associated with sleep disturbances in this population. Results from this study indicate that the majority of our sample of adolescents with depression experienced frequent and intense pain (mainly headache and musculoskeletal pain), and that high levels of pain intensity and depression predicted worse sleep quality. These results highlight the need for future investigations to examine the potentially negative impact of recurrent pain on treatment of adolescents with

depressive disorders. Adult research indicates that pain may have adverse effects on depression treatment response (Bair et al., 2004; DeVeaugh-Geiss et al., 2010), thus recognizing and managing comorbid pain may be important in enhancing treatment and remission rates in youth with depression. Additionally, although pubertal status was not related to sleep disturbance in this study, such findings may be explained by low variation in pubertal development in our study population.

A relatively understudied area of sleep research in adolescents with depression is daytime sleep disturbance, including excessive sleepiness, fatigue, and napping. Our findings suggest that adolescents with depression have high levels of fatigue across all domains (general, cognitive, and sleep/rest) and spend more time sleeping during the day compared to healthy adolescents. Within the adult literature, fatigue and depression commonly co-occur (Arnold, 2008; Leone, 2010) and their co-occurrence is related to greater functional impairment than either depression or fatigue alone (see review, Leone, 2010). The impact of adolescent fatigue and daytime sleep patterns on functional impairment in adolescents with depression deserves further exploration.

These results should be interpreted in light of this study's limitations, including sample selection and size, and cross-sectional design. Participants were recruited from a medical center in the Pacific Northwest, and do not reflect great diversity in race, ethnicity, or socioeconomic status. Because the cohort with depressive disorders was recruited from an outpatient depression center, they may not be representative of non treatment-seeking populations of adolescents with depression. In addition, research with adults and teens has supported the bi-directionality of sleep and pain, with sleep affecting subsequent pain as well as pain affecting nighttime sleep (Affleck, Urrows, Tennen, Higgins, & Abeles, 1996; Lewandowski, Palermo, De la Motte, & Fu, 2010). Future longitudinal studies are needed to further examine these interrelationships. Finally, other clinical factors not examined in this study may be important to consider in the context of sleep disturbances in youth with depression, such as anxiety. The role of anxiety symptoms will be important to consider in future studies investigating sleep and depression.

Given the prevalence and impact of sleep disturbances in adolescents with depressive disorders, further examination of the etiology of sleep dysfunction in this population is critical. Studies are emerging in the adult population indicating that treating insomnia may ameliorate the severity of depression symptomatology and other negative health-related outcomes (see Howland, 2011). Pain management could be a useful component in such cognitive-behavioral interventions. Psychological treatment studies of sleep disturbances and examination of modifiable clinical and psychosocial factors that may reduce sleep disturbances in adolescents with depression should become a priority.

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Table 1

Sociodemographic characteristics

Characteristic	Depressed (n=46) n (%) or M (SD)	Healthy (n=60) n (%) or M (SD)	Total (n=106) n (%) or M (SD)	p
Age (mean years)	15.35 (1.85)	14.83 (1.76)	15.10 (1.76)	.74
Gender				.17
Male	18 (39.1 %)	17 (28.3%)	35 (33.0%)	
Female	28 (60.9 %)	43 (71.7%)	71 (67.0%)	
Child Racial Background				.26
Caucasian	35 (76.1%)	47 (78.3%)	82 (77.4%)	
African American	1 (2.2%)	7 (11.7%)	8 (7.5%)	
Amer. Indian/Alaskan Native	3 (6.5%)	1 (1.7%)	4 (3.8%)	
Asian	1 (2.2%)	1 (1.7%)	2 (1.9%)	
Other/biracial	6 (13.1%)	4 (6.7%)	10 (9.4%)	
Family Income				.26
< $29,999	2 (4.3%)	6 (9.9%)	8 (7.6%)	
$30,000 – $49,999	7 (15.2%)	7 (11.7%)	14 (13.2%)	
$50,000 – $69,999	13 (28.2%)	13 (21.7%)	26 (24.5%)	
> $70,000	21 (45.7%)	34 (56.7%)	55 (51.9%)	
Unknown				
Pubertal Development	3 (6.5%)	0 (0.0%)	3 (2.8%)	
Total score	3.25 (.71)	3.04 (.71)	3.13 (.72)	.76
Categories				.51
Prepubertal	1 (2.2%)	5 (8.5%)	6 (5.7%)	
Early pubertal	4 (8.7%)	4 (6.8%)	8 (7.6%)	
Midpubertal	23 (50.0%)	31 (52.5%)	54 (51.5%)	
Postpubertal	18 (39.1%)	19 (32.2%)	37 (35.2%)	
Depression				
Severity (CES-D- Total)	30.53 (5.88)	8.34 (6.12)	16.75 (12.37)	<.001
Diagnosis (K-SADS)				
MDD	29 (63.0%)	--	29 (27.3%)	--
DNOS	17 (37.0%)	--	17 (16.0%)	--

Table 2

Group differences in sleep and fatigue characteristics.

Sleep and Fatigue Characteristics	Depressed (n=46) % or M(D)	Healthy (n=60) % or M(SD)	p	Partial η^2
Actigraphy Variables				
Time asleep (min)	6hr 36.41m (46.6m)	6hr 54.14m (37.3m)	.03	.04
Sleep efficiency	81.82 (6.4)	85.12 (4.0)	<.01	.07
Wake after sleep onset (WASO)	73.03 (29.6)	61.49 (18.0)	.01	.06
Nap duration (min)	1hr 1.44m (77.2m)	26.92 m (43.2m)	<.01	.07
Subjective Values *				
Sleep Hygiene (ASHS)				
Physiological	1.34 (0.6)	1.09 (0.7)	.04	.03
Cognitive	2.54 (1.0)	1.99 (0.7)	<.01	.09
Emotional	2.00 (1.0)	0.87 (0.7)	<.001	.29
Sleep Environment	1.30 (0.9)	0.65 (0.7)	<.001	.12
Substances	0.15 (0.5)	0.05 (0.3)	.20	.02
Sleep Stability	2.67 (1.1)	1.89 (0.9)	<.001	.12
Total	1.67 (0.6)	1.09 (0.4)	<.001	.24
Sleep Quality (ASWS)				
Going to bed	3.08 (1.0)	4.09 (1.0)	<.001	.19
Falling asleep	3.24 (1.1)	4.48 (.8)	<.001	.32
Maintaining sleep	3.69 (1.2)	4.68 (.8)	<.001	.21
Reinitiating sleep	4.08 (1.0)	5.15 (.6)	<.001	.31
Returning to wakefulness	2.52 (.9)	3.38 (.9)	<.001	.17
Total	3.32 (.83)	4.36 (.6)	<.001	.34
Pre-Sleep Arousal (PSAS)				
Cognitive	24.33 (6.9)	15.12 (4.5)	<.001	.38
Somatic	17.18 (5.6)	10.76 (2.8)	<.001	.39
Total	41.51 (11.0)	25.88 (6.6)	<.001	.45
Fatigue (PedsQL - Fatigue)				
General	47.92 (18.3)	77.90 (13.2)	<.001	.48
Sleep/Rest	48.20 (15.8)	70.13 (15.8)	<.001	.32
Cognitive	44.32 (18.2)	79.10 (15.7)	<.001	.52
Total	49.07 (14.9)	86.91 (13.3)	<.001	.52
Insomnia (from ASWS)				
1) Difficulty falling asleep (>60% time)	28 (66.6%)	11 (18.6%)	<.001	.44
2) Difficulty staying asleep (>60% time)	19 (43.2%)	5 (8.5%)	<.001	.36
Either 1) or 2)	32 (72.7%)	13 (22.0%)	<.001	.48

*N=45 (depressed group); 49 (healthy group)

Table 3

Group differences in pain

Pain characteristic	Depressed (n=46) n (%) or M (SD)	Healthy (n=60) n (%) or M (SD)	Total (n=106) n (%) or M (SD)	p
Primary Pain Location[a]				
Head	14 (30.5%)	10 (16.7%)	24 (20.8%)	.73
Abdomen	5 (10.9%)	7 (11.7%)	12 (11.3%)	
Back	9 (29.5%)	11 (18.3%)	20 (18.8%)	
Chest	1 (2.2%)	4 (6.7%)	5 (4.7%)	
Extremities	14 (30.4%)	16 (26.7%)	30 (26.3%)	
No Location	3 (6.5%)	12 (20.0%)	15 (14.1%)	
Usual Pain Intensity[b]	4.78 (2.09)	3.12 (2.08)	3.81 (2.21)	<.001
Pain Frequency[c]				
None	3 (6.5%)	10 (16.6%)	13 (12.3%)	<.001
<1×/mo	2 (4.3%)	14 (23.3%)	16 (15.1%)	
<1-3×/mo	8 (17.4%)	13 (21.7%)	21 (19.8%)	
Once a week	6 (13.0%)	9 (15.0%)	15 (14.2%)	
2-3 ×/week	11 (23.9%)	8 (13.3%)	19 (17.9%)	
3-6 ×/week	7 (15.2%)	4 (6.7%)	11 (10.4%)	
Daily	9 (19.6%)	2 (3.3%)	11 (10.4%)	
Pain Duration[d]				
< 1 hr	12 (26.1%)	37 (61.7%)	49 (46.2%)	<.01
A few hrs	16 (34.8%)	10 (16.7%)	26 (24.5%)	
Half the day	10 (21.7%)	6 (10.0%)	16 (15.1%)	
All day	8 (17.4%)	7 (11.7%)	15 (14.2%)	

[a] Healthy n = 52,

[b] Healthy n = 59;

[c] Healthy n = 58;

[d] Healthy n = 57