Sleep and Rest-activity Rhythms in Inpatients with Complex Concurrent Disorder

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Background

Sleep problems are highly comorbid with concurrent disorders

- Sleep disturbances are widely reported across diagnostic categories of the DSM-IV and DSM-5
- Approximately 70% of patients seeking treatment for addiction report sleep problems.
- Patients frequently complain of insufficient sleep, insomnia, poor sleep quality, and excessive daytime sleepiness.
- In response, are prescribed (more) sleep medications.

Participants

- 44 inpatients at the Burnaby Centre for Mental Health and Addiction (now called Red Fish Healing Centre for Mental Health and Addiction) volunteered to participate.
- All participants were diagnosed with a complex concurrent disorder.
- Age range of 20-60 (median age = 29)
- Most were unemployed and lived in shelters, supportive housing or other treatment centres; 20% lived with family.
- Diagnoses included: schizophrenia (79%), bipolar disorder (22%), depression (26%), anxiety disorders (34%), and ADHD (17%).
- All participants also had history of substance use, including stimulants (96%) and opioids (58%).

Medical charts and sedative load

- Past and current assessments, medical history, and records from other programs were collected.
- Mental health diagnoses
- History of substance use
- Daily records of scheduled and PRN medications
- Patient demographics
- Sedation level based on the *Sedative Load Model*

Standardized questionnaires

- *Revised Piper Fatigue Scale*
- *Brief Symptom Inventory (BSI)*
- *Impulsive Behavior Scale (UPPS-P)*
- *Munich ChronoType Questionnaire (MCTQ)*

Methods

Actigraphy

24-hour sleep and rest-activity profiles were assessed with *Readiband* by Fatigue Science. The Readiband has been validated against PSG.

An automatic scoring algorithm determines sleep and wake states.

Activity counts were imported to *Clocklab* by Actimetrics to assess non-parametric actigraphy variables RA, IV, and IS.

Table 1: Definitions of actigraphy variables

Midsleep (MS)	Indicator of chronotype (early bird vs. night owl)
Sleep duration SD)	Hours asleep at night
24-hour sleep duration (24SD)	Hours asleep in a 24 hour period
Sleep latency (SL)	Minutes to fall asleep
Wake after sleep onset (WASO)	Minutes spent awake after sleep onset occurs.
Relative amplitude (RA)	Compares the most active (10h) period to the least active (5h) period over 24 hours
Intradaily variability (IV)	Measure of circadian rhythm disturbance
Intradaily stability (IS)	Measure of strength and consistency of circadian rhythmicity

Table 2: Mean and SD of sleep-wake variables

MS (h)	2.47 ± 0.90
SD (h)	9.67 ± 1.81
24SD (h)	10.07 ± 2.05
SOL (min)	15.96 ± 10.23
WASO (min)	71.52 ± 43.62
RA	0.88 ± 0.09
IV	0.63 ± 0.16
IS	0.68 ± 0.12

Means (M) and standard deviations (SD) of time in bed (TB), sleep onset (SO), sleep end (SE), midsleep (MS), nocturnal sleep duration (SD), 24 hour sleep duration (24SD), sleep onset latency (SOL), wake after sleep onset (WASO), relative amplitude (RA), intradaily variability (IV), and interdaily stability (IS).

Results

Abnormally long sleep duration

- Nocturnal sleep duration averaged 9.67 ± 1.81h
- Average 24-hour sleep duration was 10.06 ± 2.05 hours per day.
- Long sleep duration was associated with higher amplitude, later sleep-wake phase and a trend towards greater fatigue.

Frequent nocturnal awakenings

- Nocturnal wakefulness (WASO) averaged 72 ± 44 minutes a night, with a range of 12-224 minutes.

Advanced circadian phase

- Average midsleep (2.47+/-0.90) was significantly earlier than age matched population estimates.
- Actigraphy midsleep correlated with MCTQ midsleep.
- Participants with early sleep-wake phase had higher sedative load from medications but did not report greater fatigue.

Additional findings

- Despite the increased amount of wake time during the nocturnal sleep period, the IV, IS and RA metrics suggested a more stable and higher amplitude circadian rest-activity rhythm.
- Research on these metrics in the context of mental illness is very limited and tends to be conflicted.
- Participants with higher amplitude rhythms had more severe psychiatric symptoms (GSI).

Affiliations

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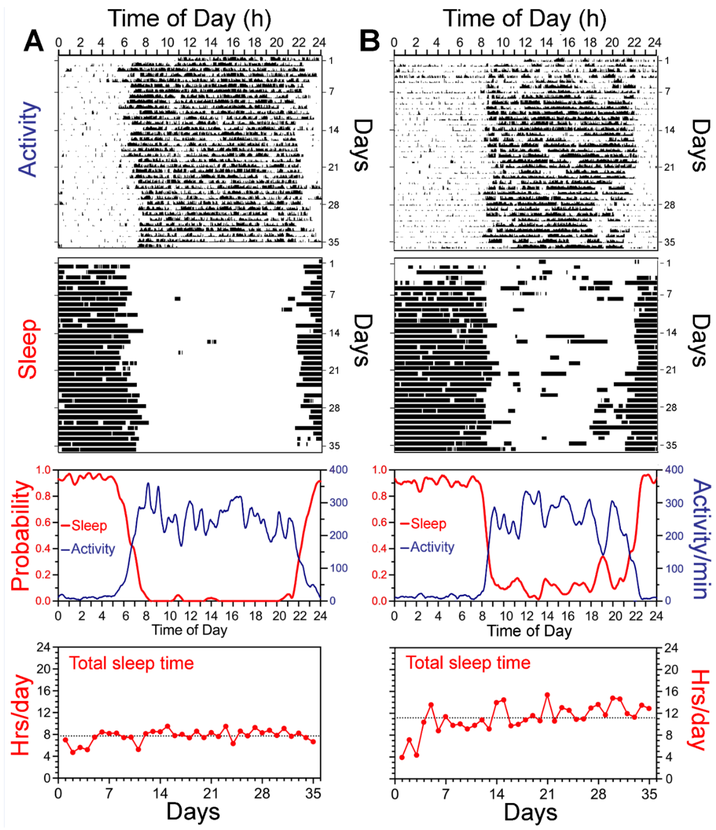
Rest-activity and sleep-wake rhythms of two representative participants recorded for 36 days



Female participant averaging 7.7 + 1.2 hrs sleep/day, with consolidated nocturnal sleep and little daytime napping.

Male participant averaging 11.5 + 2.8 hrs sleep/day, with extended and fragmented nocturnal sleep and multiple daily naps.

Table 3: Intercorrelation matrix between main rest-activity variables

	SD	MS	SOL	WASO	RA	IV	IS
SD	-	0.35*	0.17	-0.05	0.41**	-0.05	-0.14
MS	0.35*	-	0.24	-0.03	0.05	-0.12	-0.15
SOL	0.17	0.24	-	0.02	-0.12	-0.05	-0.05
WASO	-0.05	-0.03	- 0.02	-	-0.42**	0.28°	-0.29*
RA	0.41**	0.05	-0.12	-0.42**	-	-0.33*	0.27°
IV	-0.05	-0.12	-0.05	0.28°	-0.36*	-	-0.49***
IS	-0.14	-0.15	-0.05	-0.29*	0.27°	-0.49***	-
Sed	0.08	-0.42**	0.03	0.10	0.07	-0.02	0.07
Fat	0.30°	0.09	-0.07	0.07	-0.16	0.27	-0.05
GSI	0.25	0.02	-0.27	-0.10	0.35*	0.06	0.11
Impuls	0.04	-0.05	-0.01	0.08	-0.20	0.22	-0.16

*Spearman Rank correlation coefficients (N=44) between nocturnal sleep duration (SD), midsleep (MS), sleep onset latency (SOL), wake after sleep onset (WASO), relative amplitude (RA), intradaily variability (IV), interdaily stability (IS), fatigue, Global Severity Index (GSI), impulsiveness (Impuls) and sedative load (Sed). ° p ≤ 0.1, * p ≤ 0.05; ** p ≤ 0.01; ***p ≤ 0.001. After Bonferroni correction, none of the correlations remained significant.*