Association Between Sleep Continuity and Cognition in Breast Cancer Survivors: A Cross-Sectional Study

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Background

- **Cancer-related cognitive difficulties (CRCD)** is prevalent and distressing for breast cancer survivors and commonly co-occurs with **insomnia**.
- Although sleep tracking has become increasingly common in oncology settings, little is known about how sleep patterns influence cognition in cancer survivors.
- Therefore, we aim to characterize the associations between subjective and objective sleep continuity and cognition in breast cancer survivors with insomnia and CRCD.

Aims

- To describe the sleep patterns of the study population.
- To characterize the associations between sleep continuity and cognition in breast cancer survivors with insomnia and CRCD.

Methods and Materials

- This analysis includes **baseline data** from the **ENHANCE** clinical trial, conducted among 260 breast cancer survivors with **insomnia** (Insomnia Severity Index score ≥ 8) and self-reported **CRCD**.
- This analysis is limited to trial participants who **completed sleep tracking measures**, including the Consensus Sleep Diary (CSD) and Actiwatch or FitBit smart watch (WA).

Statistical Analysis

- Multivariate linear regression modeling was used to explore associations between sleep continuity and cognition.

Outcomes:

- **Sleep patterns**: wake after sleep onset (WASO), number of awakenings (NWAK), time spent in bed (TIB), total sleep time (TST), and sleep efficiency (SE).
- **Cognitive measures**: Subjective: Functional Assessment of Cancer Therapy-Cognition Perceived Cognitive Impairment domain (FACT-Cog PCI); Objective: Hopkins Verbal Learning Test-Revised (HVLT-R) Delayed Recall normed T-score.

Covariates:

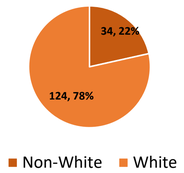
- All models included adjustments from covariates: chemotherapy use, cancer stage, race, and education.

Results

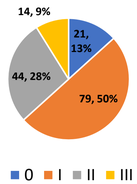
Characteristics of participants (N=158):

- Age, mean (range), years: 57 (28-83)
- Education: at least a college education: N=116 (75.3%)
- Cancer stage: 0-I: N=100 (63.3%); II-III: N=58 (36.7%)
- Previous chemotherapy: 86 (54.4%)

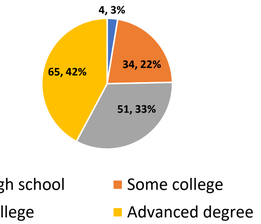
Participant Race



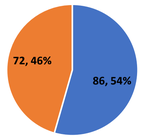
Cancer Stage



Education



Previous Chemotherapy



Descriptive Statistics

		N	Range	Minimum	Maximum	Mean	Std. Deviation
Consensus Sleep Diary	TST (min)	151	446	189	635	387.6	72.2
	TIB (min)	152	449	286	735	495.2	66.6
	WASO (min)	152	232	1	233	43.2	35.4
	NWAK	152	8.66	0.1	8.71	2.6	1.4
	SE (%)	151	58	40	98	78.4	10.6
Watch	TST (min)	82	709	142	851	421.1	101.5
	TIB (min)	82	854	175	1029	512.0	123.3
	WASO (min)	82	248	13.4	261.5	63.5	36.9
	NWAK	82	130	0.0	130.0	33.6	23.4
	SE (%)	82	47	48.5	95.2	82.4	8.4

Objective Cognition and Sleep Continuity

	Sleep Variable	B	Beta	P-value	95% CI
Consensus Sleep diary	TST	0.007	0.046	0.58	[−0.020,0.034]
	TIB	-0.021	-1.12	0.16	[−0.050,0.008]
	WASO	-0.072	-0.22	0.008 *	[−0.13,−0.019]
	NWAK	-1.14	-0.13	0.10	[−2.50,0.23]
	SE	0.19	0.17	0.044 *	[0.008,0.36]
Watch	TST	-0.01	-0.075	0.51	[-0.039, 0.019]
	TIB	-0.01	-0.095	0.40	[-0.034, 0.014]
	WASO	0.02	0.045	0.69	[-0.062, 0.094]
	NWAK	-0.17	-0.30	0.009*	[-0.29, -0.044]
	SE	0.15	0.77	0.45	[-0.24, 0.54]

Adjusted multivariate linear regressions were conducted for variables showing significant correlations:

- In CSD data, greater WASO was associated with poorer objective cognition (β = –.24, p = .003, 95% CI [–0.14, –0.028]), while higher sleep efficiency was associated with better objective cognition (β = .21, p = .011, 95% CI [0.054, 0.42]).
- In WA data, more nighttime awakenings were associated with poorer objective cognition (β = –.30, p = .010, 95% CI [–0.29, –0.042]).

Subjective Cognition and Sleep Continuity

	Sleep Variable	B	Beta	P-value	95% CI
Consensus Sleep diary	TST	-0.002	-0.010	0.91	[-0.029, 0.025]
	TIB	0.013	0.069	0.40	[-0.016, 0.042]
	WASO	0.028	0.077	0.35	[−0.029, 0.085]
	NWAK	-0.98	-0.11	0.18	[−2.42, 0.45]
	SE	-0.044	-0.037	0.65	[−0.23,0.15]
Watch	TST	0.009	0.076	0.50	[−0.016,0.034]
	TIB	0.009	0.095	0.40	[−0.013,0.031]
	WASO	0.025	0.076	0.50	[−0.048,0.098]
	NWAK	0.11	0.21	0.064	[−0.004,0.22]
	SE	-0.005	-0.003	0.98	[−0.32,0.31]

None of the sleep variables, measured both by CSD and by WA, showed statistically significant correlations with subjective cognition (all p>0.06).

Main Limitations

- Study population included individuals with insomnia and CRCD, so findings may differ from those with CRCD alone.
- Most participants had a college-level education or higher.
- We used two different types of smart watch to measure objective cognitive function, rather than one standard type.
- This study was conducted at a large, urban academic cancer center, so findings may not be generalizable.

Conclusions

- Measured and reported sleep continuity was **not** significantly associated with **subjective cognition**.
- **Sleep fragmentation**, measured by both sleep diary and smart watch, was significantly associated with **worse objective cognition** in breast cancer survivors with comorbid **insomnia** and **CRCD**.
- Interventions targeting sleep fragmentation could be used to promote cognitive health during breast cancer survivorship.

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