

Understanding Sleep Disturbance in Postmenopausal Women through Wearable Devices and Mobile Applications

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OBJECTIVES

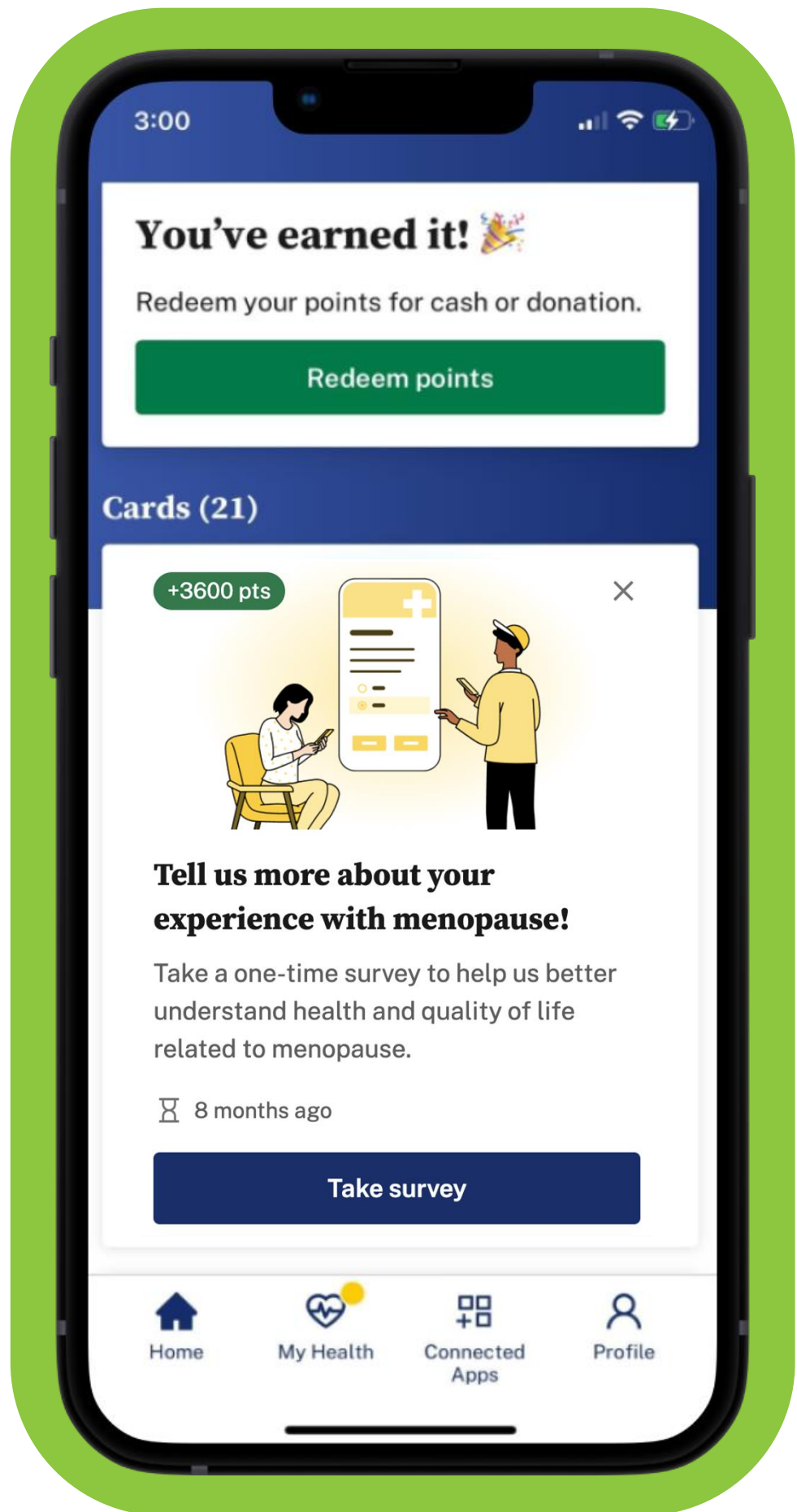
→ Sleep disturbance and vasomotor symptoms (VMS) are frequent and disruptive symptoms for women during menopause; these symptoms can also be interconnected. **Commercial wearable devices are widely used but the relationship between objective sleep measures collected through devices and menopause symptoms has not been investigated.** This study examined the relationship between wearable sleep measures and self-reported menopausal symptoms including nighttime VMS and VMS severity.

DESIGN

→ The Evidation mobile application was used to survey postmenopausal women on VMS burden and sleep disturbance. Women consented to completing the survey and to linking wearable device data to their responses.

METHODS

→ **Women aged 40-65 were included if they experienced VMS in the last 30 days, had their last menstrual period at least 12 months prior, and had 70% wearable data availability for select sleep metrics in the past 30 nights.** Participants were excluded for current breastfeeding, hormonal contraceptive use, hypothalamic amenorrhea, or menopause due to cancer therapy. Survey items included menopause symptom burden and symptom management. Sleep disturbance was assessed through an adapted Patient-Reported Outcomes Measurement Information System Sleep Disturbance - Short Form 8bb (PROMIS-SD-SF-8b). VMS severity was assessed using the hot flash daily diary (HFDD) questionnaire adapted for a cross-sectional survey. Descriptive statistics were analyzed for baseline characteristics, wakefulness after sleep onset (WASO) and sleep duration. Bivariate analyses described initial correlations between objective sleep measures and nighttime VMS severity.



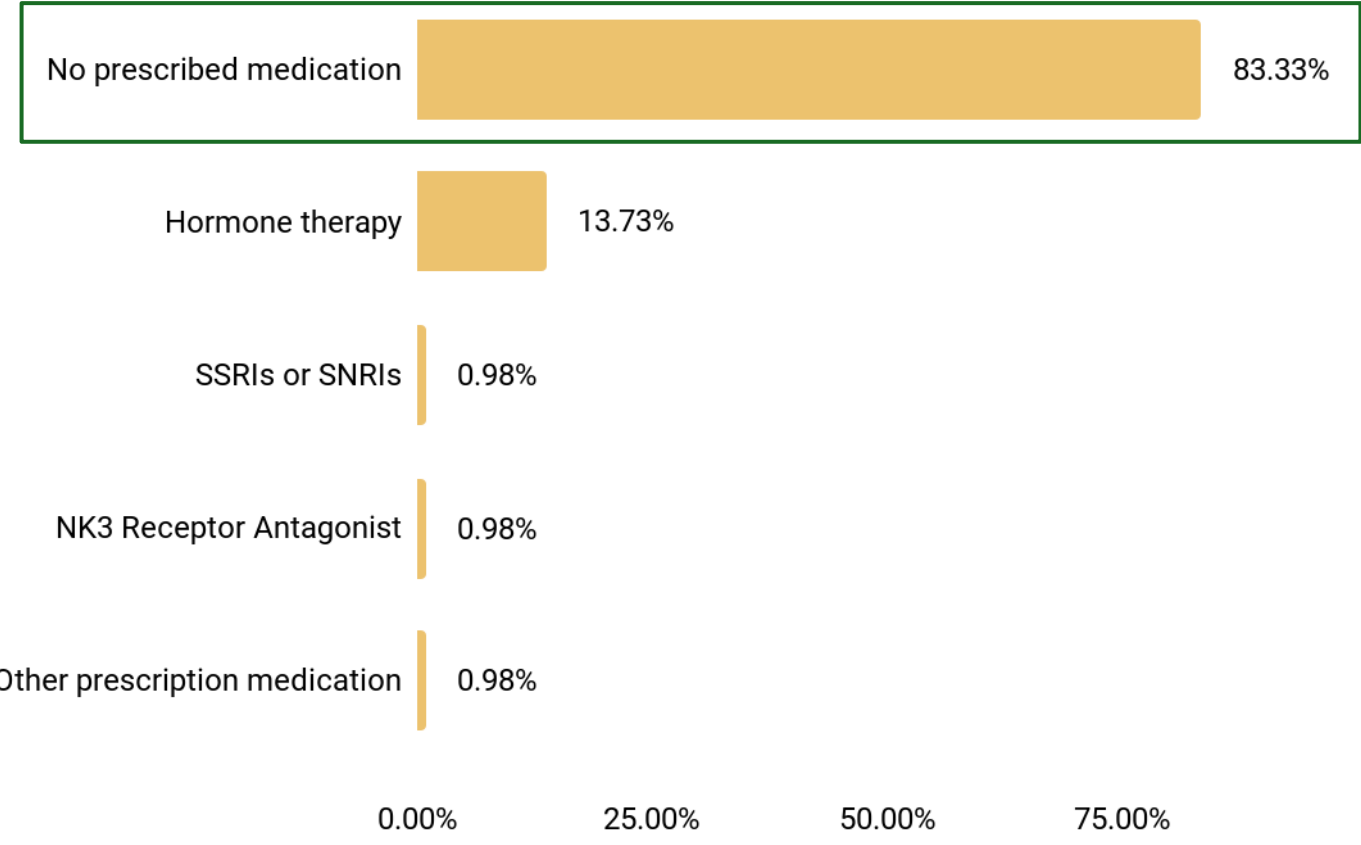
RESULTS

Table 1

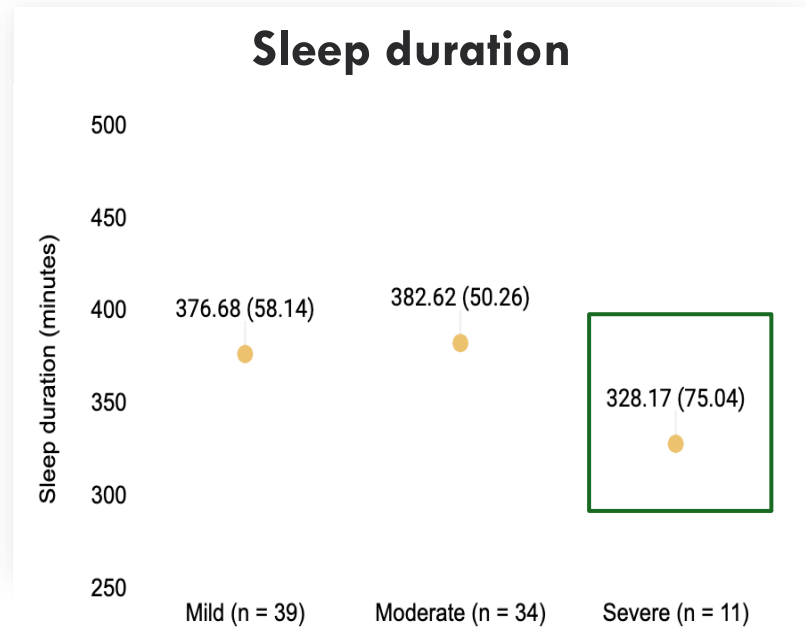
Demographics		All participants (N = 102)
Age (years)	Mean (SD)	56.10 (5.02)
	Median, IRQ	56 (52.25, 60)
	Range	44 - 65
Ethnicity, N (%)	Hispanic, Latino	10 (9.80%)
	Not Hispanic, Latino	92 (90.20%)
Race, N (%)	White	53 (51.96%)
	Black, African American	20 (19.61%)
	Asian	8 (7.84%)
	Other	4 (3.92%)
	Multiple	10 (9.80%)
	Race not reported ¹	7 (6.86%)
Education, N (%)	No high school diploma or equivalent	1 (0.98%)
	High school diploma or equivalent	14 (13.73%)
	Some college, no degree	12 (11.76%)
	Trade/technical/vocational training	3 (2.94%)
	College degree (bachelor's degree or higher)	72 (70.59%)

¹ 7 participants reported Hispanic, Latino ethnicity, but did not report a separate race.

Do you currently take any of the following prescribed medications to help manage your menopause symptoms?

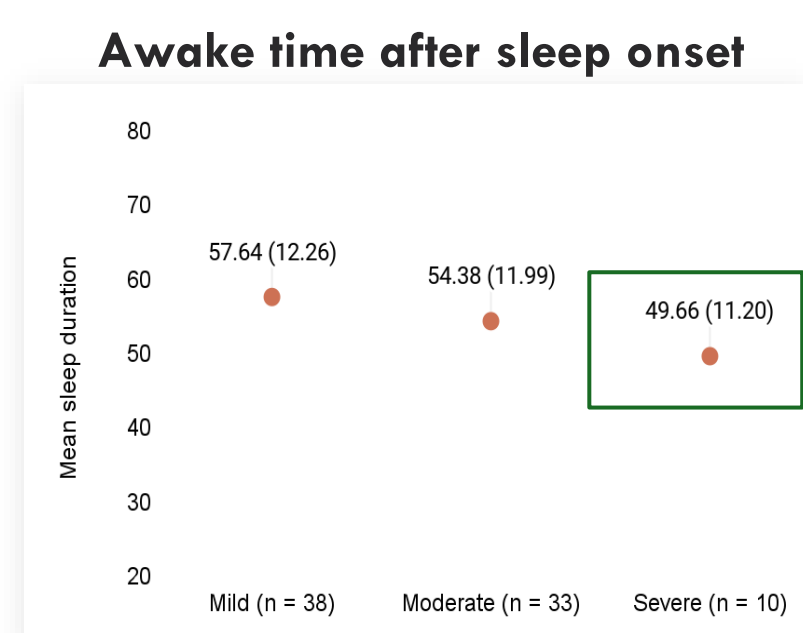


Past Week Sleep and Nighttime Hot Flash Severity



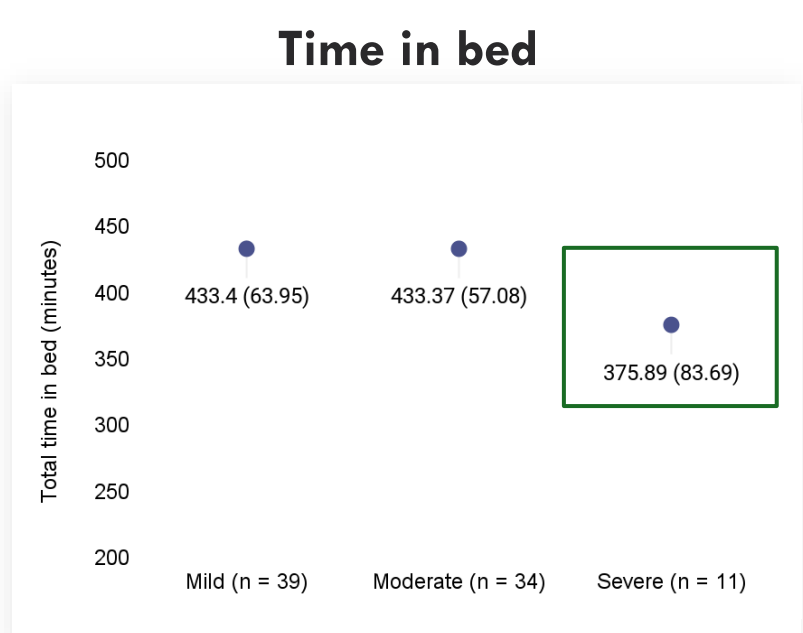
49

Participants in the 'Severe' nighttime hot flash group had **49 fewer minutes** of sleep per night, on average, compared to the 'Mild' group



8

Participants in the 'Severe' nighttime hot flash group also had **8 fewer minutes awake after sleep onset**, on average, compared to the 'Mild' group.



58

Participants in the 'Severe' nighttime hot flash group had **almost 1 less hour in bed**, on average, compared to the 'Mild' group.

Pairwise Correlations for Past Week Sleep Features and VMS Severity

- Average number of nightly **mild** hot flashes was **positively associated** with mean **sleep duration** $r_s(31) = 0.35$, $p = .04$
- Average number of nightly **moderate** hot flashes was **positively associated** with mean **sleep efficiency** $r_s(40) = 0.32$, $p = .04$
- As frequency of severe hot flashes increased, sleep duration and sleep efficiency decreased, while awake time increased.

Activity Features		Frequency of nighttime hot flashes by severity		
		Mild	Moderate	Severe
Mean sleep duration	n	33	42	29
	r_s	0.35*	-0.04	-0.10
Mean awake time after sleep onset	n	32	40	28
	r_s	0.30	-0.06	0.27
Mean sleep efficiency	n	33	42	29
	r_s	-0.15	0.32*	-0.23

CONCLUSIONS

- Data generated through mobile applications and wearable devices directly from women during menopause may provide additional insights on the relationship between objective and subjective measures of sleep disturbance and nighttime VMS.
- Data from wearable devices can help track and characterize menopause symptoms over time and may potentially support discussions between women and their healthcare provider(s).
- Despite reporting disrupting symptoms, a large proportion of women (83%) report not using any prescription treatments, showcasing an unmet need for treatment options.

LIMITATIONS

- The study population may not be representative of the broader population of those who experience menopause symptoms. For example, the study sample skews towards higher educational attainment (71% hold a college degree).
- The study required continuous use of a specific wearable device (Fitbit), which may have resulted in a study population that is more active in tracking their health behaviors, including menopause symptoms, limiting generalizability.

DISCLOSURES

- This study was funded by Bayer AG, Berlin, Germany

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