



Supplementary Information for
Light Exposure During Sleep Impairs Cardiometabolic Function

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Methods

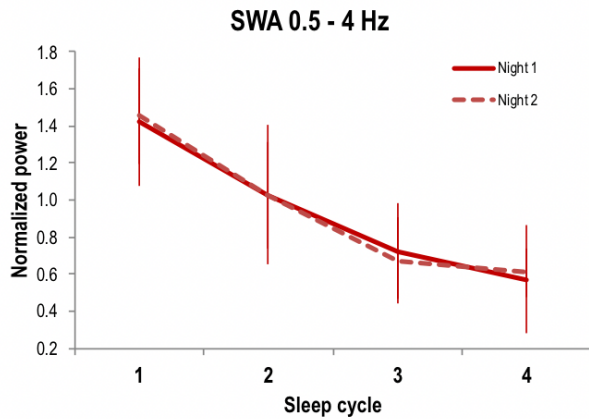
Sleep fragmentation and sleep-wake stage stability. Measures of sleep fragmentation and sleep-wake stage stability were derived from the PSG using a dedicated software (PRANA, PhiTools, Strasbourg, France): number and average duration of the wake episodes during the sleep period, number of infra-sleep awakenings (ISA; awakenings occurring after sleep onset and before morning awakening) with duration > 2 min., total number of transitions between wake-sleep stages, and % of each wake/sleep stage stability (the ratio between the number of transitions from the considered wake/sleep stage to the same stage divided by the total number of transitions from this stage; higher values indicate higher stage stability).

Table S1. Measures of sleep fragmentation and stage stability derived from polysomnography

	Room light Condition			Dim light Condition			<i>P</i>
	Night 1	Night 2	Δ (Night 2) - (Night 1)	Night 1	Night 2	Δ (Night 2) - (Night 1)	
Awakenings (n)	20.7 ± 7.9	16.3 ± 05.4	-4.4 ± 6.0	25.2 ± 10.7	18.9 ± 6.5	-6.3 ± 6.6	0.486 ^a
Awakenings duration (min.)	1.9 ± 1.3	2.6 ± 3.0	0.8 ± 2.5	1.6 ± 0.5	1.1 ± 0.4	-0.5 ± 0.7	0.240 ^b
ISA > 2 min. (n)	3.3 ± 2.9	0.9 ± 0.9	-2.4 ± 3.5	3.2 ± 2.4	1.1 ± 1.3	-2.1 ± 2.1	0.758 ^b
Stage transitions (n)	127.1 ± 23.4	117.6 ± 28.5	-9.5 ± 28.6	151.4 ± 44.1	129.9 ± 27.6	-21.5 ± 29.7	0.353 ^a
Wake stability (%)	62.5 ± 21.6	57.8 ± 29.3	-4.6 ± 39.3	63.3 ± 19.1	49.1 ± 15.9	-14.2 ± 27.7	0.686 ^a
N1 stability (%)	39.2 ± 12.4	41.4 ± 14.5	2.2 ± 20.5	39.5 ± 10.0	36.9 ± 17.7	-2.61 ± 14.1	0.667 ^a
N2 stability (%)	88.9 ± 1.8	89.1 ± 2.2	0.21 ± 2.3	87.0 ± 5.2	87.6 ± 3.9	0.54 ± 2.7	0.708 ^a
SWS stability (%)	86.7 ± 8.2	88.1 ± 3.9	1.4 ± 6.7	84.6 ± 4.1	87.4 ± 3.5	2.8 ± 3.5	0.465 ^a
REM stability (%)	96.1 ± 1.7	94.8 ± 2.6	-1.3 ± 2.9	95.7 ± 1.7	95.9 ± 1.0	0.2 ± 1.5	0.289 ^b

ISA > 2 min= number of infra-sleep awakenings with duration > 2 minutes occurring after sleep onset and before morning awakening; N1= non rapid eye movement (NREM) sleep stage 1, N2= NREM sleep stage 2, SWS= slow wave sleep; REM= rapid eye movement. Stage stability was defined as the ratio between the number of transitions from the considered sleep-wake stage to the same stage, and the total number of transitions from this stage (i.e., higher values indicate higher stage stability). *p* values refer to differences in Δ (Night 2) - (Night 1) between room light and dim light conditions. (a) two-sided *t*-test; (b) nonparametric two-sided Wilcoxon rank-sum test.

ROOM LIGHT CONDITION



DIM LIGHT CONDITION

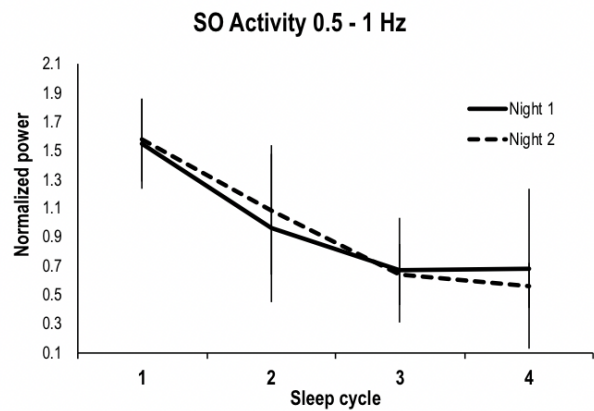
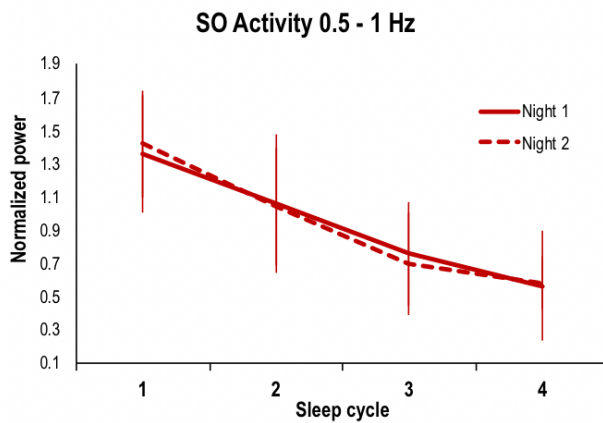
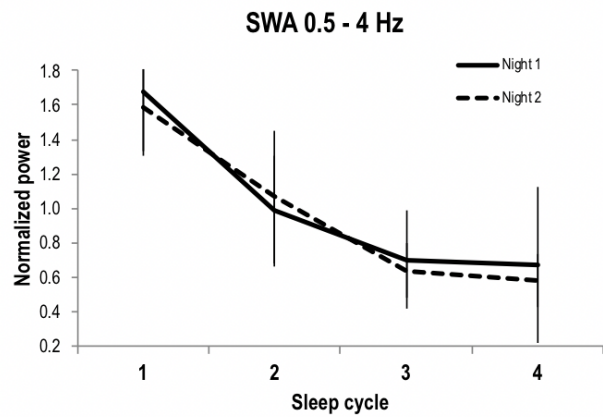


Fig. S1. Changes in slow wave activity (SWA) and slow oscillatory (SO) activity across the sleep cycles on Night 1 and Night 2 in the room light (left panels, N= 9) and dim light (right panels, N= 9) conditions. SWA and SO activity levels across the sleep cycles from Night 1 to Night 2 were similar between the two conditions (General Linear Model: condition x night and group x night x cycle $p > 0.05$). The amount of SWA and SO activity in each cycle was calculated and normalized respectively to the amount of SWA or SO activity averaged across the entire night. Error bars represent standard deviation. One out of ten participants in each condition was excluded from the analyses due to EEG artifacts (> 20%).

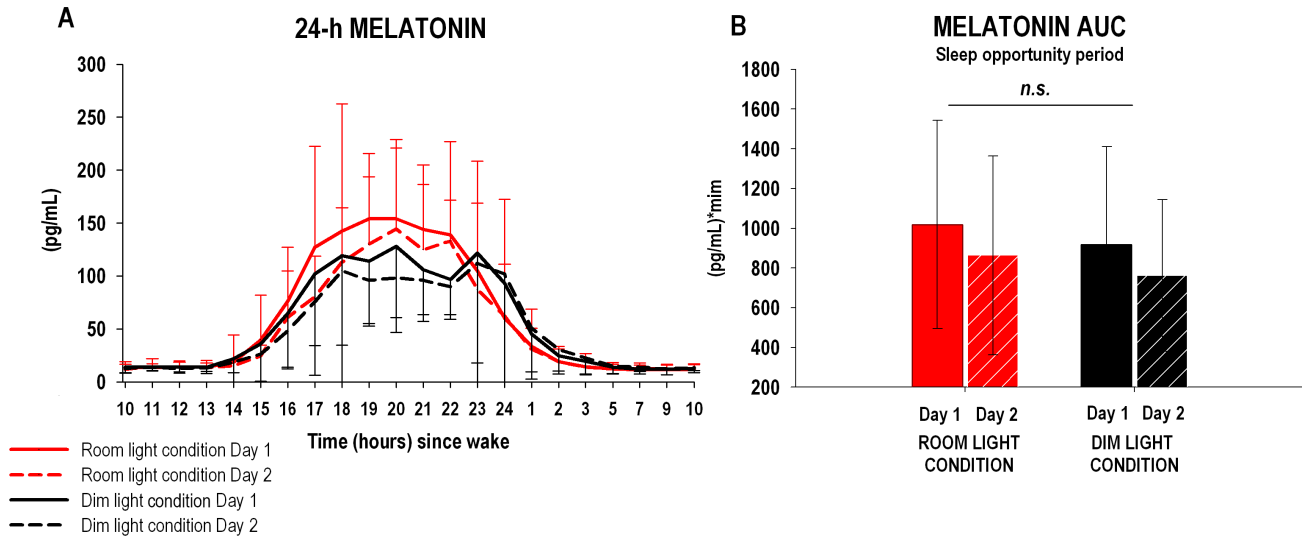


Fig. S2. 24-h Plasma melatonin and area under the curve (AUC) of melatonin during the sleep opportunity period (16 hours since wake to 24 hours since wake) in the room light (N= 8) and dim light (N= 7) conditions on Day 1 and Day 2. Changes in 24-h melatonin (**panel A**) and melatonin AUC during the sleep period (**panel B**) from Day/Night 1 to Day/Night 2 were not significantly different between room light and dim light conditions (General Linear Model: condition x day $p= 0.96$). Not significant (n.s.) statistics in panel B refers to the change from Day 1 to Day 2 between conditions (unpaired t-test). Error bars represent standard deviation. Two participants in the room light condition and three participants in the dim light condition were not included in the analysis due to poor sample quality.

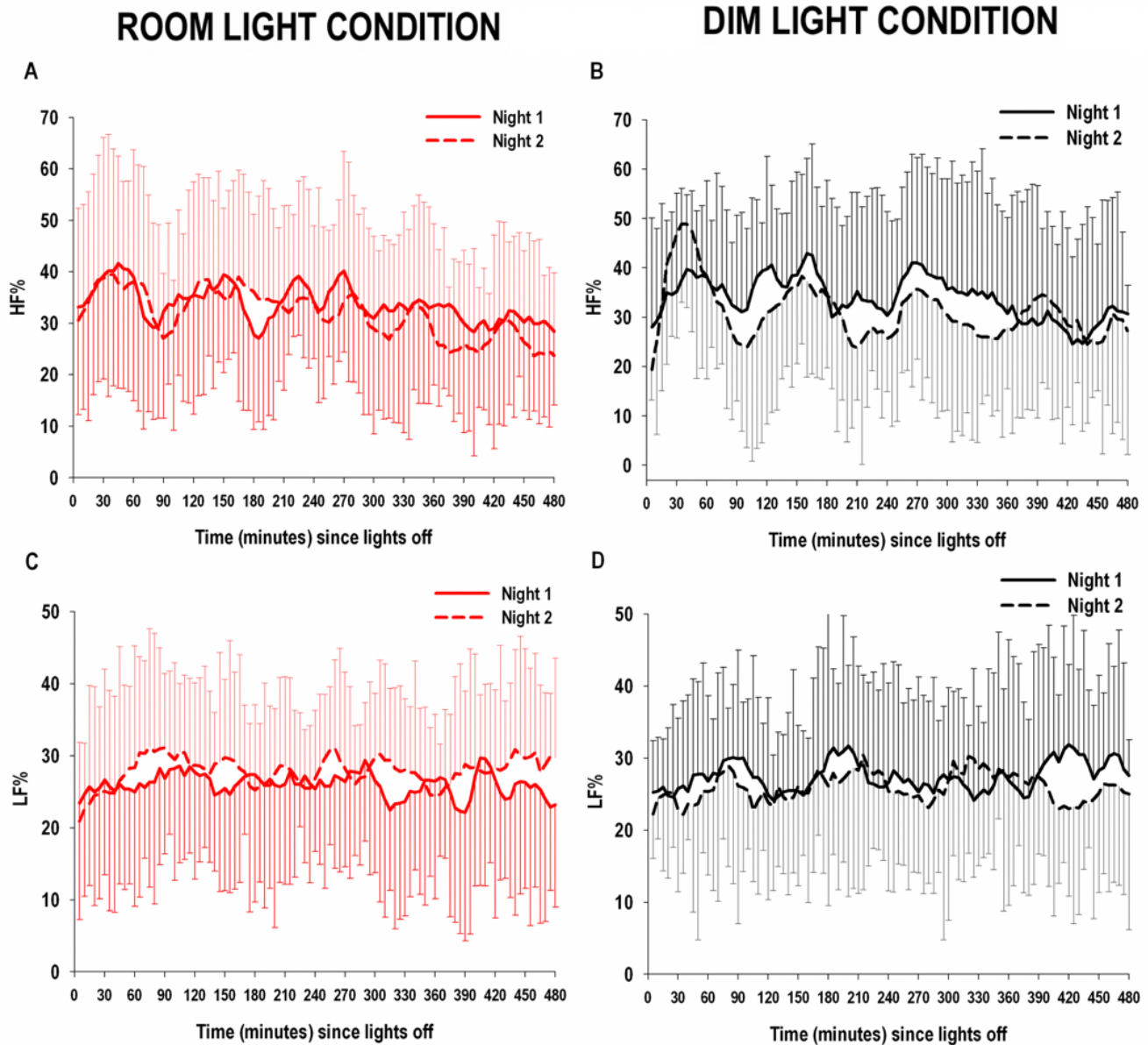


Fig. S3. Top panels: high frequency relative power (HF%) obtained from heart rate variability (HRV) analysis during the sleep period for room light (panel A, N= 10) and dim light (panel B, N=10) conditions on Night 1 and Night 2. Lower panels: low frequency relative power (LF%) obtained from HRV analysis during the sleep period for room light (panel C) and dim light (panel D) conditions on Night 1 and Night 2. HF% and LF% were calculated on time windows with a stable signal of at least 5 min for the entire duration of the sleep period, starting from lights off. Change in HF% from Night 1 to Night 2 was not different between room light and dim light conditions (General Linear Model: condition x night $p=0.86$). Change in LF% from Night 1 to Night 2 was significantly larger in participants randomized to the room light condition compared to those randomized to the dim light condition (General Linear Model: condition x night $p < 0.0001$). Error bars represent standard deviation.