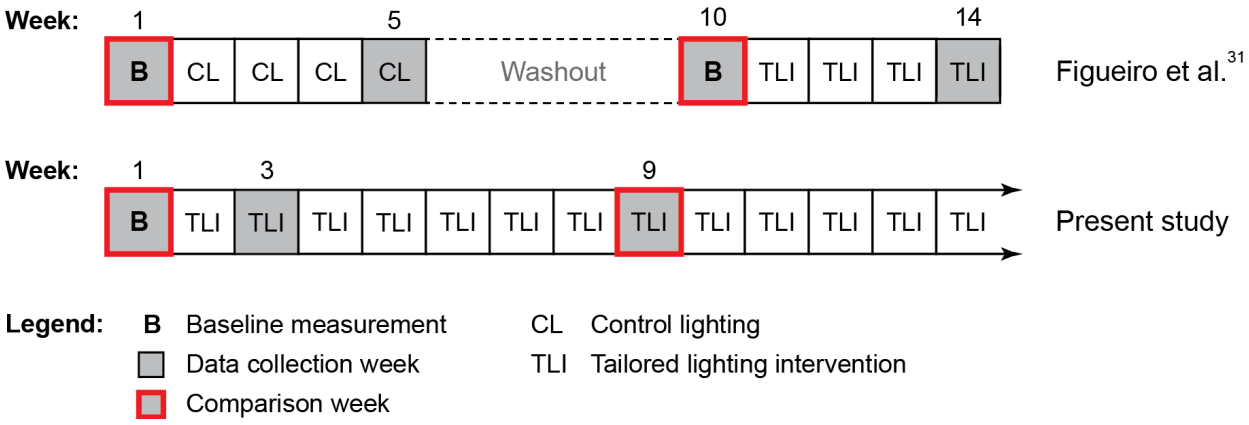
Supplementary Material

Long-Term, All-Day Exposure to Circadian-Effective Light Improves Sleep, Mood, and Behavior in Persons with Dementia



Supplementary Figure 1. Experimental protocols for our previously published study [31] and the present study, showing the schedule for delivering the control lighting (CL) and the tailored lighting intervention (TLI) to the respective participants. The data collection weeks selected for comparisons between the two studies are indicated by a bold, red outline. The schedule shown for the previous placebo-controlled, crossover study is for the participants who were exposed to the control lighting during weeks 2–5 and the TLI during weeks 11–14 (i.e., after comparison week 10).

Supplementary Table 1. Specification and description of the light delivery devices employed in this study

Device	CCT (K)	Light level at eyes (lux)	Targeted CS	Fixture dimensions (l × w × h [in.])	Height above floor (in.)	Lighting components (model; manufacturer)
Floor luminaires	5000	600	0.4	24.0 × 4.5 × 4.0	56.5	4 × Ultra LED; OSRAM Sylvania, Wilmington, MA
	7000	550	0.4	24.0 × 4.5 × 4.0	56.5	4 × Align AM; GE Lighting, Cleveland, OH
Light box	6000	350	0.4	24.0 × 7.0 × 7.5	Variable	2 × G2 linear accent, driven by N3 controller; Ketra, Austin, TX
Light tables	5000	750	0.4	61.0 × 39.0 × 5.0	29.0	70-in. LED edge-lit television; Sharp Corporation, Montvale, NJ
	6300	400	0.4	61.0 × 39.0 × 5.0	29.0	ALZLED LED; XtraLight Manufacturing, Houston, TX
	4000	850	0.4	48.0 × 48.0 × 4.0	29.0	4 × ET220 LED; GE lighting, East Cleveland, OH

Each light delivery device targeted a CS = 0.4 at eye level. Depending on the device type, the CCT and light levels were modulated to achieve the target CS. CCT, correlated color temperature; CS, circadian stimulus; K, kelvin; LED, light-emitting diode.

Supplementary Table 2. The number of participants included in the analyses for each field monitoring procedure.

Field monitoring procedure	Participants per data collection week (n)				
	Baseline	Week 3	Week 9	Week 17	Week 25
Questionnaires	47	47	41	34	32
Actigraphy	45	43	35	31	29
Daysimeter	43	39	38	31	27

Fifteen participants (32%) did not complete all 25 weeks of the study. Two participants were excluded from the actigraphy analysis because they did not wear the actigraph during one or more data collection weeks.

Supplementary Table 3. *Post hoc* comparisons for the primary aim's main effects, by outcome measure

Outcome	Main effect	Pairwise comparison	df	*p*	*t*	Cohen's *d*
PSQI	Data collection week	**Baseline–week 3**	**124.42**	**<0.001**	**6.36**	**0.82**
		Baseline–week 9	**121.39**	**<0.001**	**7.71**	**1.14**
		Baseline–week 17	**88.81**	**<0.001**	**7.36**	**1.25**
		Baseline–week 25	**67.52**	**<0.001**	**8.95**	**1.68**
		Week 3–week 9	**127.25**	**0.03**	**2.98**	**0.31**
		Week 3–week 17	**128.36**	**0.04**	**2.94**	**0.47**
		Week 3–week 25	**86.70**	**<0.001**	**4.73**	**0.89**
		Week 9–week 17	133.03	1.00	0.72	0.19
		Week 9–week 25	125.80	0.07	2.71	0.63
		Week 17–week 25	125.18	0.15	2.44	0.39
	Sex	**Male–female**	**43.18**	**0.01**	**2.63**	**1.04**
IV	**Cognitive state**	**Mild-moderate–severe**	**39.62**	**0.04**	**0.19**	**0.76**
Actual sleep time	Sex	**Male–female**	**42.34**	**0.04**	**-2.18**	**-0.68**
	Cognitive state	**Mild-moderate–severe**	**42.34**	**0.003**	**3.09**	**1.01**
Actual sleep percentage	Sex	**Male–female**	**40.29**	**0.04**	**-2.17**	**-0.61**
Actual wake percentage	Sex	**Male–female**	**40.35**	**0.03**	**2.20**	**0.65**
Sleep efficiency	Data collection week	**Baseline–week 3**	**78.54**	**0.04**	**-2.98**	**-0.43**
		Baseline–week 9	103.60	0.05	-2.83	-0.26
		Baseline–week 17	**128.08**	**<0.001**	**-4.72**	**-0.67**
		Baseline–week 25	**124.45**	**<0.001**	**-4.36**	**-0.49**
		Week 3–week 9	83.47	1.00	0.39	0.18
		Week 3–week 17	109.65	0.54	-1.80	-0.37
		Week 3–week 25	128.24	0.84	-1.39	-0.13
		Week 9–week 17	91.97	0.38	-2.01	-0.49
		Week 9–week 25	101.98	0.53	-1.82	-0.28
		Week 17–week 25	86.71	1.00	0.34	0.20
Sleep onset latency	Data collection week	Baseline–week 3	106.67	1.00	-0.43	-0.05
		Baseline–week 9	128.48	0.18	2.37	0.56
		Baseline–week 17	110.18	1.00	0.65	0.32
		Baseline–week 25	86.39	0.94	-1.16	-0.08
		Week 3–week 9	**109.60**	**0.02**	**3.18**	**0.53**
		Week 3–week 17	135.84	0.98	1.00	0.33
		Week 3–week 25	110.15	0.99	-0.88	-0.04
		Week 9–week 17	113.88	0.61	-1.71	-0.22
		Week 9–week 25	**135.17**	**0.01**	**-3.35**	**-0.42**
		Week 17–week 25	108.49	0.29	-2.15	-0.28
	Cognitive state	**Mild-moderate–severe**	**39.30**	**0.049**	**-2.03**	**-0.52**

Supplementary Table 4. *Post hoc* comparisons for depression (CSDD), showing the significant main effect of data collection week

Pairwise comparisons	df	*p*	*t*	*d*
Baseline–week 3	**114.43**	**<0.001**	**5.23**	**0.78**
Baseline–week 9	**128.09**	**<0.001**	**6.07**	**0.94**
Baseline–week 17	**97.33**	**<0.001**	**5.50**	**0.91**
Baseline–week 25	**77.93**	**<0.001**	**6.97**	**1.28**
Week 3–week 9	117.73	0.46	1.90	0.21
Week 3–week 17	134.64	0.69	1.60	0.21
Week 3–week 25	**94.12**	**0.02**	**3.23**	**0.68**
Week 9–week 17	124.65	1.00	0.08	0.01
Week 9–week 25	131.55	0.50	1.85	0.48
Week 17–week 25	114.89	0.41	1.97	0.45

Supplementary Table 5. *Post hoc* comparisons for agitation (CMAI), showing the significant interactions between cognitive state and data collection week

Factor	Pairwise comparison	df	*p*	*t*	*d*
Data collection week × cognitive state					
Mild-moderate	Baseline–week 3	129.03	0.30	2.12	0.24
	Baseline–week 9	**124.22**	**0.03**	**3.02**	**0.48**
	Baseline–week 17	87.99	0.48	1.88	0.28
	Baseline–week 25	60.23	0.11	2.59	0.48
	Week 3–week 9	134.73	0.54	1.80	0.28
	Week 3–week 17	127.14	1.00	0.66	0.07
	Week 3–week 25	82.51	0.77	1.51	0.20
	Week 9–week 17	135.87	1.00	-0.79	-0.19
	Week 9–week 25	124.34	1.00	0.40	-0.02
	Week 17–week 25	131.57	0.92	1.24	0.20
Severe	**Baseline–week 3**	**129.03**	**<0.001**	**4.33**	**0.72**
	Baseline–week 9	**116.55**	**<0.001**	**4.78**	**1.01**
	Baseline–week 17	**79.12**	**<0.001**	**4.92**	**1.16**
	Baseline–week 25	**52.86**	**<0.001**	**4.68**	**1.19**
	Week 3–week 9	129.03	0.55	1.79	0.39
	Week 3–week 17	122.84	0.23	2.26	0.62
	Week 3–week 25	77.43	0.29	2.16	0.69
	Week 9–week 17	134.75	0.94	1.17	0.18
	Week 9–week 25	118.25	0.96	1.11	0.27
	Week 17–week 25	130.79	1.00	0.25	0.12

Supplementary Table 6. Multiple comparisons between baseline and intervention.

Outcome	Factor	df	*p*	*t*	*d*
Sleep quality (PSQI)	**Active**	**87.08**	**<0.001**	**7.92**	**1.14**
	Control	**82.50**	**0.01**	**2.68**	**0.46**
Depression (CSDD)	**Active**	**87.75**	**<0.001**	**6.33**	**0.94**
	Control	83.78	0.16	1.42	0.19
Agitation (CMAI)	**Active**	**83.94**	**<0.001**	**5.18**	**0.61**
	Control	81.59	0.31	1.02	0.10