

SUPPLEMENTARY MATERIALS:

Table S1. Participant characteristics for Experiment 1

	Younger adults	Older adults
Age		
Age range	18-30	51-84
Mean	20.10	65.47
Sex		
Female	48	18
Male	31	16
Ethnicity		
First nations	0	1
Hispanic	3	0
Middle Eastern	10	0
Black	2	0
Asian	42	3
White	18	29
Mixed ethnicity	4	1
Medical history		
Mental health disorder	14	10
Neurological condition	4	4
Sleep disorder		
Sleep apnea	0	4
Insomnia	2	0
Insomnia and sleep apnea	0	2
Other sleep disorders	2	0
AD family history		
Yes	-	6
No	-	22
Not sure	-	6

Table S2. Summary of sleep and circadian rhythm parameters

Participants	TST (h)	Sleep efficiency (%)	SOL (h)	WASO (h)	Amplitude	Acrophase (h)	IV	IS
	Mean \pm SD	Mean \pm SD	Mean \pm SD	Mean \pm SD	Mean \pm SD	Mean \pm SD	Mean \pm SD	Mean \pm SD
Older adults	7.20 \pm 0.97	90.69 \pm 3.97	0.06 \pm 0.02	0.65 \pm 0.33	1.67 \pm 0.66	14.21 \pm 1.85	1.13 \pm 0.31	0.42 \pm 0.14
Younger adults	6.65 \pm 0.83	89.69 \pm 4.83	0.06 \pm 0.02	0.66 \pm 0.36	1.63 \pm 0.59	17.20 \pm 1.85	1.04 \pm 0.29	0.38 \pm 0.10

Abbreviations: TST, total sleep time; SOL, sleep onset latency; WASO, wake after sleep onset; IV, intradaily variability; IS, interdaily stability.

Table S3. Performance on the cognitive tests for the younger and older adults in Experiment 1

	Sleep parameters			
	Average TST		Average SE	
	<i>r</i> / ρ (df)	<i>p</i>	<i>r</i> / ρ (df)	<i>p</i>
Younger adults				
PVT outcomes				
(n = 76)				
10% Slowest RT	$\rho(74) = -0.004$	.49	$\rho(74) = -0.20$	.04*
Cognitive slowing	$r(74) = 0.07$	.27	$\rho(74) = 0.20$	.04*
MST outcomes				
(n = 67)				
LDI	$\rho(65) = 0.01$	.46	$\rho(65) = 0.18$	.07
REC	$\rho(65) = 0.12$	.16	$\rho(65) = 0.01$	.48
L1 Accuracy	$r(65) = -0.01$	.46	$\rho(65) = 0.16$	.09
L2 Accuracy	$r(65) = 0.06$	.33	$\rho(65) = 0.13$	.15
L1 False Memory Error Rate	$\rho(65) = 0.11$	.18	$\rho(65) = -0.05$	.34
L2 False Memory Error Rate	$r(65) = -0.11$	.20	$\rho(65) = -0.09$	.24
CANTAB outcomes				
(n = 73)				
DMS Error (All Delays, Incorrect Pattern)	$\rho(71) = 0.09$	.22	$\rho(71) = -0.09$	.22
PAL First Attempt	$\rho(71) = -0.15$	.10	$\rho(71) = 0.03$	.41
PAL Mean Errors to Success	$\rho(71) = 0.12$	.16	$\rho(71) = -0.12$	.16
PAL Adjusted Errors	$\rho(71) = 0.14$	.13	$\rho(71) = -0.05$	.34
RTI	$\rho(71) = 0.03$	.41	$\rho(71) = 0.09$	.23
SWM Between Errors	$\rho(71) = 0.004$	.49	$\rho(71) = -0.10$	.19
SWM Between Errors (Strategy)	$\rho(71) = 0.01$	.47	$\rho(71) = 0.02$	.42
Older adults				

PVT outcomes (n = 30)

10% Slowest RT	$\rho(28) = -0.38$	.02*	$\rho(28) = -0.21$	.13
Cognitive Slowing	$r(28) = 0.35$	.03*	$r(28) = 0.25$	.09

**MST outcomes
(n = 19)**

LDI	$r(17) = 0.30$	.11	$r(17) = 0.14$	.28
REC	$r(17) = -0.28$	.12	$r(17) = -0.39$	.048*
L1 Accuracy	$r(17) = 0.44$	.03*	$r(17) = 0.13$	.29
L2 Accuracy	$r(17) = 0.11$	.32	$r(17) = 0.06$	.40
L1 False Memory Error Rate	$r(17) = -0.43$	.03*	$r(17) = -0.15$	.27
L2 False Memory Error Rate	$r(17) = -0.20$	.21	$r(17) = 0.01$	.49

**CANTAB outcomes
(n = 34)**

DMS Errors (All Delays, Incorrect Pattern)	$\rho(32) = 0.20$	.13	$\rho(32) = 0.13$	.24
PAL First Attempt	$r(32) = 0.08$	.33	$r(32) = 0.004$	.49
PAL Mean Errors to Success	$\rho(32) = -0.04$	.41	$\rho(32) = 0.08$	.32
PAL Adjusted Errors	$\rho(32) = 0.05$	.38	$\rho(32) = 0.05$	.39
RTI	$r(32) = -0.002$	.50	$r(32) = 0.27$	.06
SWM Between Errors	$\rho(32) = -0.05$	.39	$\rho(32) = -0.06$	.37
SWM Between Errors (Strategy)	$r(32) = -0.10$	.29	$r(32) = -0.13$	.22

Abbreviations: MST, Mnemonic Similarity Task; LDI, Lure Discrimination Index; REC, Recognition Memory; L1, Lure Bin 1; L2, Lure Bin 2; CANTAB, Cambridge Neuropsychological Test Automated Battery; DMS, Delayed Matching to Sample; PAL, Paired Associates Learning; RTI, Reaction Time Inventory; SWM, Spatial Working Memory.

Correlations with non-normal data were conducted using Spearman's rank correlation (ρ).

Table S4. Correlations between MST and CANTAB outcomes and Clocklab parameters in Experiment 1

MST outcomes	Clocklab parameters							
	Amplitude		Acrophase		IV		IS	
	<i>r</i> / ρ (df)	<i>p</i>	<i>r</i> / ρ (df)	<i>p</i>	<i>r</i> / ρ (df)	<i>p</i>	<i>r</i> / ρ (df)	<i>p</i>
Younger adults								
MST outcomes (n = 45)								
LDI	$r(43) = 0.30$	.02*	$r(43) = 0.12$	.21	$r(43) = -0.21$	.09	$r(43) = 0.05$	.36
REC	$\rho(43) = 0.01$	.48	$\rho(43) = -0.08$	.31	$\rho(43) = 0.17$	.14	$\rho(43) = -0.04$	.40
L1 Accuracy	$r(43) = 0.08$	.30	$r(43) = 0.01$	.47	$r(43) = -0.10$	.25	$r(43) = -0.11$	.23
L2 Accuracy	$r(43) = 0.31$	.02*	$r(43) = 0.28$	.03*	$r(43) = -0.25$	.048*	$r(43) = -0.04$	.39
L1 False Memory Error Rate	$\rho(43) = -0.04$	.40	$\rho(43) = 0.02$	.45	$\rho(43) = 0.19$	.11	$\rho(43) = 0.15$	.17
L2 False Memory Error Rate	$r(43) = -0.19$	.11	$r(43) = -0.19$	.11	$r(43) = 0.20$	.09	$r(43) = 0.10$	.27
CANTAB outcomes (n = 46)								
DMS Total Errors All Delays (Pattern)	$\rho(44) = 0.02$	.45	$\rho(44) = 0.01$	.47	$\rho(44) = 0.12$	.21	$\rho(44) = -0.21$	.08
PAL First Attempt	$\rho(44) = -0.06$	.35	$\rho(44) = -0.13$	.20	$\rho(44) = -0.09$	.28	$\rho(44) = 0.15$	.15
PAL Mean Errors to Success	$\rho(44) = 0.19$	.11	$\rho(44) = 0.07$	.32	$\rho(44) = 0.002$	.50	$\rho(44) = -0.19$	.10
PAL Adjusted Errors	$\rho(44) = 0.04$	.40	$\rho(44) = 0.11$	.23	$\rho(44) = 0.12$	.21	$\rho(44) = -0.14$	.17
RTI	$\rho(44) = -0.28$	.03*	$\rho(44) = 0.27$	.03*	$\rho(44) = 0.01$	.48	$\rho(44) = -0.10$	.26
SWM Between Errors	$\rho(44) = 0.07$	.32	$\rho(44) = -0.30$	.02*	$\rho(44) = 0.25$	.05*	$\rho(44) = 0.04$	.41
SWM Between Errors (Strategy)	$\rho(44) = 0.13$	.20	$\rho(44) = -0.26$	.04	$\rho(44) = 0.05$	.37	$\rho(44) = 0.02$	.46

Older adults

**MST outcomes
(n = 18)**

LDI	$r(16) = -0.21$	.20	$r(16) = -0.02$	.46	$r(16) = 0.36$	.07	$r(16) = 0.14$	.29
REC	$r(16) = 0.25$	.16	$r(16) = 0.31$	.10	$r(16) = -0.34$	.08	$r(16) = -0.20$	.21
L1 Accuracy	$r(16) = -0.15$	.28	$r(16) = 0.09$	.37	$r(16) = 0.08$	.37	$r(16) = 0.15$	.28
L2 Accuracy	$r(16) = -0.25$	.16	$r(16) = -0.01$	.49	$r(16) = 0.33$	.09	$r(16) = 0.27$	.14
L1 False Memory Error Rate	$r(16) = 0.14$	.29	$r(16) = -0.09$	.36	$r(16) = -0.001$	.50	$r(16) = -0.19$	.22
L2 False Memory Error Rate	$r(16) = 0.14$	.29	$r(16) = 0.03$	.46	$r(16) = -0.20$	.21	$r(16) = -0.43$	.04*

**CANTAB outcomes
(n = 32)**

DMS Total Errors All Delays (Pattern)	$\rho(30) = -0.24$	.10	$\rho(44) = -0.23$	.11	$\rho(30) = 0.22$	.11	$\rho(30) = -0.07$	.36
PAL First Attempt	$r(30) = 0.17$	.18	$r(30) = -0.07$	.34	$r(30) = -0.22$	.11	$r(30) = 0.07$	.35
PAL Mean Errors to Success	$\rho(30) = 0.01$	.49	$\rho(30) = -0.13$	.24	$\rho(30) = 0.05$	.39	$\rho(30) = 0.08$	.34
PAL Adjusted Errors	$\rho(30) = -0.13$	.24	$\rho(30) = 0.02$	.47	$\rho(30) = 0.15$	.21	$\rho(30) = -0.10$	.29
RTI	$\rho(30) = 0.07$	.36	$\rho(30) = -0.05$	.40	$\rho(30) = -0.03$	.44	$\rho(30) = 0.12$	.25
SWM Between	$\rho(30) = -0.12$	.26	$\rho(30) = -0.14$	.23	$\rho(30) = 0.11$	.28	$\rho(30) = -0.02$	.47
SWM Between Errors (Strategy)	$\rho(30) = 0.07$	.35	$\rho(30) = -0.27$	.07	$\rho(30) = 0.01$	.49	$\rho(30) = 0.11$	.28

Abbreviations: MST, Mnemonic Similarity Task; LDI, Lure Discrimination Index; REC, Recognition Memory; L1, Lure Bin 1; L2, Lure Bin 2; DMS, Delayed Matching to Sample; PAL, Paired Associates Learning; RTI, Reaction Time Inventory; SWM, Spatial Working Memory. Correlations with non-normal data were conducted using Spearman's rank correlation (ρ).

Table S5. Correlations between performance on cognitive tests and MoCA in Experiment 1

Cognitive outcomes	MoCA	
	<i>r</i> / ρ (df)	<i>p</i>
PVT outcomes		
(n = 30)		
10% Slowest RT	$\rho(28) = -0.14$	.23
Cognitive slowing	$r(28) = 0.30$	.06
MST outcomes		
(n = 19)		
LDI	$r(17) = 0.34$	.078
REC	$r(17) = 0.10$	.34
L1 Accuracy	$r(17) = 0.56$	.006**
L2 Accuracy	$r(17) = 0.12$	.32
L1 False Memory Error Rate	$r(17) = -0.52$	.01*
L2 False Memory Error Rate	$r(17) = -0.14$	.28
CANTAB outcomes		
(n = 34)		
DMS Error (All Delays, Incorrect Pattern)	$\rho(32) = -0.06$	.37
PAL First Attempt	$r(32) = 0.50$	.001**
PAL Mean Errors to Success	$\rho(32) = -0.13$	.23
PAL Adjusted Errors	$\rho(32) = -0.41$	.009**
RTI	$r(32) = -0.18$	.15
SWM Between Errors	$\rho(32) = -0.54$	<.001***
SWM Between Errors (Strategy)	$\rho(32) = -0.34$	.02*

Abbreviations: MST, Mnemonic Similarity Test; LDI, Lure Discrimination Index; REC, Recognition memory; L1, Lure Bin 1; L2, Lure Bin 2; CANTAB, Cambridge Neuropsychological Test Automated Battery; DMS, Delayed Matching to Sample; PAL, Paired Associates Learning; RTI, Reaction Time Inventory; SWM, Spatial Working Memory.

Correlations with non-normal data were conducted using Spearman's rank correlation (ρ).

Table S6. Participant characteristics for Experiment 2

	Rested	Sleep Deprived
Age		
Age range	18-25	20-34
Mean	20.20	26.00
Sex		
Female	13	4
Male	12	5
Ethnicity		
Hispanic	0	1
Asian	10	4
Middle Eastern	2	2
White	6	2
First Nations	1	0
Indian	3	0
Fijian	1	0
Mixed ethnicity	2	0

Table S7. Comparison of cognitive test performance between rested and sleep deprived participants in Experiment 2

Cognitive outcomes	Rested group	Sleep deprived group	Test statistic(df)	<i>p</i>
	Mean \pm SEM MD (IQR)	Mean \pm SEM MD (IQR)		
PVT				
Rested n = 22 Sleep deprived n = 9				
10% Slowest RT	437.10 (413.80 – 495.20)	488.80 (421.40 – 528.10)	<i>U</i> (29) = 76	.17
Cognitive slowing	2.23 \pm 0.08	2.14 \pm 0.10	<i>t</i> (29) = .61	.27
MST				
Rested n = 21 Sleep deprived n=6				
LDI	0.40 \pm 0.04	0.32 \pm 0.05	<i>t</i> (25) = 1.09	.14
REC	0.84 (0.79 - 0.89)	0.90 (0.85 - 0.93)	<i>U</i> (25) = 32	.04*
L1 Accuracy	0.34 \pm 0.04	0.28 \pm 0.05	<i>t</i> (25) = 0.73	.24
L2 Accuracy	0.49 \pm 0.04	0.29 \pm 0.07	<i>t</i> (25) = 2.11	.02*
L1 False Memory Error Rate	0.59 \pm 0.04	0.70 \pm 0.05	<i>t</i> (25) = 1.36	.09
L2 False Memory Error Rate	0.38 (0.31 - 0.46)	0.69 (0.46 - 0.77)	<i>U</i> (25) = 23	.008**
CANTAB				
Rested n = 25 Sleep deprived n = 9				
DMS Error (All Delays, Incorrect Pattern)	1.00 (0.00 - 2.00)	0.00 (0.00 - 1.50)	<i>U</i> (32) = 87	.17
PAL First Attempt	15.00 (14.00 – 17.50)	19.00 (16.00 – 19.00)	<i>U</i> (32) = 59.50	.02*
PAL Mean Errors to Success	1.00 (0.00 – 2.00)	0.00 (0.00 – 1.00)	<i>U</i> (32) = 66	.04*

PAL Adjusted Errors	6.00 (2.50 – 8.00)	1.00 (1.00 – 4.00)	$U(32) = 53.50$	.01*
RTI	240.70 ± 9.90	240.60 ± 19.86	$t(32) = .01$	.50
SWM Between Errors	13.00 (2.50 – 18.50)	2.00 (0.00 – 14.50)	$U(32) = 72$	.06
SWM Between Errors (Strategy)	8.00 (6.00 – 9.00)	7.00 (3.00 – 8.00)	$U(32) = 82$	.12

Abbreviations: PVT, Psychomotor Vigilance Task; TST, total sleep time; RT, reaction time; MST, Mnemonic Similarity Test; LDI, Lure Discrimination Index; REC, Recognition memory; L1, Lure Bin 1; L2, Lure Bin 2; CANTAB, Cambridge Neuropsychological Test Automated Battery; DMS, Delayed Matching to Sample; PAL, Paired Associates Learning; RTI, Reaction Time Inventory; SWM, Spatial Working Memory.
