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Reporting Checklist for Nature Neuroscience

This checklist is used to ensure good reporting standards and to improve the reproducibility of published results. For more information, please read Reporting Life Sciences Research.

Please note that in the event of publication, it is mandatory that authors include all relevant methodological and statistical information in the manuscript.

Statistics reporting, by figure

- Please specify the following information for each panel reporting quantitative data, and where each item is reported (section, e.g. Results, & paragraph number).
- Each figure legend should ideally contain an exact sample size (n) for each experimental group/condition, where n is an exact number and not a range, a clear definition of how n is defined (for example x cells from x slices from x animals from x litters, collected over x days), a description of the statistical test used, the results of the tests, any descriptive statistics and clearly defined error bars if applicable.
- For any experiments using custom statistics, please indicate the test used and stats obtained for each experiment.
- Each figure legend should include a statement of how many times the experiment shown was replicated in the lab; the details of sample collection should be sufficiently clear so that the replicability of the experiment is obvious to the reader.
- For experiments reported in the text but not in the figures, please use the paragraph number instead of the figure number.

Note: Mean and standard deviation are not appropriate on small samples, and plotting independent data points is usually more informative. When technical replicates are reported, error and significance measures reflect the experimental variability and not the variability of the biological process; it is misleading not to state this clearly.

		TEST USED		n			DESCRIPTIVE STATS (AVERAGE, VARIANCE)		P VALUE		DEGREES OF FREEDOM & F/t/z/R/ETC VALUE	
	FIGURE NUMBER	WHICH TEST?	SECTION & PARAGRAPH #	EXACT VALUE	DEFINED?	SECTION & PARAGRAPH #	REPORTED?	SECTION & PARAGRAPH #	EXACT VALUE	SECTION & PARAGRAPH #	VALUE	SECTION & PARAGRAPH #
example	1a	one-way ANOVA	Fig. legend	9, 9, 10, 15	mice from at least 3 litters/group	Methods para 8	error bars are mean +/- SEM	Fig. legend	p = 0.044	Fig. legend	F(3, 36) = 2.97	Fig. legend
example	results, para 6	unpaired t-test	Results para 6	15	slices from 10 mice	Results para 6	error bars are mean +/- SEM	Results para 6	p = 0.0006	Results para 6	t(28) = 2.808	Results para 6

		TEST USED		n			DESCRIPTIVE STATS (AVERAGE, VARIANCE)		P VALUE		DEGREES OF FREEDOM & F/t/z/R/ETC VALUE	
	FIGURE NUMBER	WHICH TEST?	SECTION & PARAGRAPH #	EXACT VALUE	DEFINED?	SECTION & PARAGRAPH #	REPORTED?	SECTION & PARAGRAPH #	EXACT VALUE	SECTION & PARAGRAPH #	VALUE	SECTION & PARAGRAPH #
+ -	1i NREM 1 HZ	unpaired two-tailed Student's t-Test	Fig. legend	10,9	mice from 3 litters		error bars are mean +/- SEM, YFP (66.74 ± 6.673 N=10), ChETA (30.41 ± 2.686 N=9)	Not reported	0.0002	Fig legend	t=4.846 df=17	Not reported
+ -	1i NREM 20 Hz	unpaired two-tailed Student's t-Test	Fig. legend	11,9	mice from 3 litters		error bars are mean +/- SEM, YFP (66.44 ± 6.397 N=11), ChETA (2.94 ± 7.11 N=9)	Not reported	< 0.0001	Fig legend	t=8.912 df=18	Not reported
+ -	1i NREM 1 s	unpaired two-tailed Student's t-Test	Fig. legend	4, 3	mice from 3 litters		error bars are mean +/- SEM, YFP (61 ±4.4 N=4), ChETA (3.6 ± 0.30 N=3)	Not reported	0.0001	Fig legend	t=11 df=5	Not reported
+ -	1i REM 1 Hz	unpaired two-tailed Student's t-Test	Fig. legend	10,8	mice from 3 litters		error bars are mean +/- SEM, YFP (72.2 ±3.45 N=10), ChETA (63.6 ± 5.22 N=8)	Not reported	0.1739	Fig legend	t=1.42 df=16	Not reported
+ -	1i REM 20 Hz	unpaired two-tailed Student's t-Test	Fig. legend	11,9	mice from 3 litters		error bars are mean +/- SEM, YFP (61.3 ± 3.90 N=8), ChETA (67.7 ± 4.56 N=8)	Not reported	0.3093	Fig legend	t=1.06 df=14	Not reported
+ -	1i REM 1 s	unpaired two-tailed Student's t-Test	Fig. legend	5,3	mice from 3 litters		error bars are mean +/- SEM, YFP (69.0 ±5.02 N=5), ChETA (71.4 ± 12.8 N=3)	Not reported	0.8384	Fig legend	t=0.213 df=6	Not reported
+ -	2e	unpaired two-tailed Student's t-Test	Fig. legend	5,5	slices from 5 animals		error bars are mean +/- SEM 61.70 +/-12.93, N=5, bic (5.167± 0.54 N=5)	Not reported	0.0119	Fig legend	t=4.369 df=4.014	Not reported
+ -	2f	unpaired two-tailed Student's t-Test	Fig. legend	5,5	slices from 5 animals		error bars are mea (0.901 +/-0.0515 SEM, N=5, bic (0.909 ± 0.08 N=5)	Not reported	p=0.135	Fig legend	t=0.0838 df=8	Not reported
+ -	3f 1Hz	unpaired two-tailed Student's t-Test	Fig. legend	5,7	mice from 3 litters		error bars are mean +/- SEM, YFP(57.9 ±3.82 N=5), ChETA (34.9 ± 2.57 N=7)	Not reported	0.0004	Fig legend	t=5.21 df=10	Not reported
+ -	3f 20 Hz	unpaired two-tailed Student's t-Test	Fig. legend	5,7	mice from 3 litters		error bars are mean +/- SEM, YFP (65.9 ±4.10 N=5), ChETA (11.7 ± 1.91 N=7)	Not reported	< 0.0001	Fig legend	t=13.2 df=10	Not reported
+ -	3f on	unpaired two-tailed Student's t-Test	Fig. legend	5,7	mice from 3 litters		error bars are mean +/- SEM, YFP(63.7 ±3.84 N=5), ChETA (2.77 ± 0.299 N=7)	Not reported	< 0.0001	Fig. legend	t=19.1 df=10	Not reported

+ -	3g 1 Hz	unpaired two-tailed Student's t-Test	Fig. legend	6,7	mice from 3 litters		error bars are mean +/- SEM, YFP(18.0 ±3.47 N=6), ChETA (16.7 ±3.59 N=7)	Not reported	0.8046	Fig. legend	t=0.253 df=11	Not reported
+ -	3g 20 Hz	unpaired two-tailed Student's t-Test	Fig. legend	6,7	mice from 3 litters		error bars are mean +/- SEM, YFP(22.7 ±4.817 N=6), ChETA (17.7 ±3.82 N=7)	Not reported	0.4259	Fig. legend	t=0.827 df=11	Not reported
+ -	3g on	unpaired two-tailed Student's t-Test	Fig. legend	6,7	mice from 3 litters		error bars are mean +/- SEM, YFP(15.5 ±1.70 N=6), ChETA (18.1 ±3.92 N=7)	Not reported	0.5815	Fig. legend	t=0.568 df=11	Not reported
+ -	3h 1 Hz	unpaired two-tailed Student's t-Test	Fig. legend	5,7	mice from 3 litters		error bars are mean +/- SEM, YFP(72.7 ±4.84 N=5), ChETA (73.7 ±4.989 N=7)	Not reported	0.8919	Fig. legend	t=0.139 df=10	Not reported
+ -	3h 20Hz	unpaired two-tailed Student's t-Test	Fig. legend	5,7	mice from 3 litters		error bars are mean +/- SEM, YFP(76.5 ±6.37 N=5), ChETA 62.1 ±3.93 N=7)	Not reported	0.0696	Fig. legend	t=2.03 df=10	Not reported
+ -	3 h on	unpaired two-tailed Student's t-Test	Fig. legend	5,7	mice from 3 litters		error bars are mean +/- SEM, YFP(78.1 ±4.47 N=5), ChETA 61.6 ±6.29 N=7)	Not reported	0.0786	Fig. legend	t=1.96 df=10	Not reported
+ -	5e	unpaired two-tailed Student's t-Test	Fig. legend	4,6	mice from 3 litters`		error bars are mean +/- SEM, YFP(64.1 ±6.25 N=4), ChETA 18.7 ±1.56 N=6)	Not reported	< 0.0001	Fig. legend	t=8.54 df=8	Not reported
+ -	5f	unpaired two-tailed Student's t-Test	Fig. legend	5,6	mice from 3 litters		error bars are mean +/- SEM, YFP(67.5 ±5.14 N=5), ChETA 54.1 ±5.30 N=6)	Not reported	0.1073	Fig. legend	t=1.79 df=9	Not reported
+ -	5g	unpaired two-tailed Student's t-Test	Fig. legend	4,6	mice from 3 litters		error bars are mean +/- SEM, YFP(30.2 ±12.4 N=4), ChETA (15.4 ± 1.65 N=6)	Not reported	0.1753	Fig. legend	t=1.49 df=8	Not reported
+ -	7d before	unpaired-t test, Two-tailed	Fig. legend	4,4. N represents the total number of animals, each animal value is the average of at least three stimulation trials	mice from 3 litters		error bars are mean +/- SEM, YFP(11.5 ±2.07 N=4), ChETA (15.4 ± 2.20 N=4)	Not reported	0.2392	Fig. legend	t=1.31 df=6	Not reported
+ -	7d +1min	unpaired-t test, Two-tailed	Fig. legend	4,4	mice from 3 litters		error bars are mean +/- SEM, YFP(11.4 ±1.97 N=4), ChETA (28.6 ± 4.47 N=4)	Not reported	0.0126	Fig. legend	t=3.51 df=6	Not reported

+ -	7d+ 2min	unpaired-t test, Two-tailed	Fig. legend	4,4	mice from 3 litters		error bars are mean +/- SEM, YFP(12.1 ±4.26 N=4), ChETA (35.0 ± 3.68 N=4)	Not reported	0.0065	Fig. legend	t=4.08 df=6	Not reported
+ -	7e before e	unpaired-t test, Two-tailed	Fig. legend	4,4	mice from 3 litters		error bars are mean +/- SEM, YFP(81.6 ± 3.41 N=4), ChETA (81.0 ± 2.05 N=4)	Not reported	0.8837	Fig. legend	t=0.153 df=6	Not reported
+ -	7e, + 1 min	unpaired-t test, Two-tailed	Fig. legend	4,4	mice from 3 litters		error bars are mean +/- SEM, YFP(80.9 ± 3.20 N=4), ChETA (53.2 ± 7.86 N=4)	Not reported	0.0171	Fig. legend	t=3.27 df=6	Not reported
+ -	7e, + 2 min	unpaired two-tailed Student's t-Test	Fig. legend	4,4	mice from 3 litters		error bars are mean +/- SEM, YFP(81.0 ± 6.08 N=4), ChETA (47.7 ±9.84 N=4)	Not reported	0.0103	Fig. legend	t=3.68 df=6	Not reported
+ -	7f before e	unpaired two-tailed Student's t-Test	Fig. legend	4,4	mice from 3 litters		error bars are mean +/- SEM, YFP(8.02 ± 1.86 N=4), ChETA (14.0 ± 1.63 N=4)	Not reported	0.0529	Fig. legend	t=2.41 df=6	Not reported
+ -	7f, + 1 min	unpaired two-tailed Student's t-Test	Fig. legend	4,4	mice from 3 litters		error bars are mean +/- SEM, YFP(7.41 ± 1.256 N=4), ChETA (12.7 ± 0.778 N=4)	Not reported	0.0112	Fig. legend	t=3.61 df=6	Not reported
+ -	7f, + 2 min	unpaired two-tailed Student's t-Test	Fig. legend	4,4	mice from 3 litters		error bars are mean +/- SEM, YFP(8.53 ±1.74 N=4), ChETA (13.7 ± 2.03 N=4)	Not reported	0.1003	Fig. legend	t=1.94 df=6	Not reported
+ -	S4 c	One- way ANOVA within subject design	Fig. legend	8 for BS (non stimulated), 7 for YFP, and 8 for ChETA	4 litters		not reported in the text	Not reported	P < 0.0001	S.Fig legend	For wake F (5, 28) = 21.47	Not reported
+ -	S4 d	One- way ANOVA withing subject design	Fig. legend	8 for BS (non stimulated), 5 for YFP, and 5 for ChETA	4 litters		not reported in the text	Not reported	0.0001	S.Fig legend	F (DFn, DFd), F (3, 14) = 14.94	Not reported
+ -	S8 b	unpaired two-tailed Student's t-Test	Fig. legend	10 ,9	mice from 3 litters		Mean latencies ± S.E.M of NREM sleep to wake transitions upon optical stimulation of LHGABA terminals in the posterior TRN field in control (white; n=10) and ChETA-EYFP (blue; n=9) animals.	Fig. legend	P<0.05(1 Hz), P<0.05(20Hz), P< 0.0001 (1s pulses)	S.Fig legend, Figure (*, ***)	-	-

+ -	S8 c	unpaired two-tailed Student's t-Test	Fig. legend	5,7	mice from 3 litters		Mean latencies ± S.E.M of REM sleep to wake transitions upon optical stimulation of LHGABA terminals in the posterior TRN field in control (white; n=5) and ChETA-EYFP (blue; n=7) animals.	Fig. legend	non significant	S.Fig legend	-	-
+ -	4b	One- way ANOVA	Fig. legend	4,4,4,4,3	mice from at least 3 litters		error bars are mean +/- SEM,	Not reported	0.0009	S.Fig legend	1s YFP_LC vs. 1sCheta_LC, t=3.36; 1s YFP_MS vs. 1S _MS_Cheta,t 0.52; 1s YFP_Ms vs. 1s _PVaCheta, t=2.59	Not reported
+ -	4c	One- way ANOVA	Fig. legend	4,4,4,4,3	mice from at least 3 litters		error bars are mean +/- SEM,	Not reported	0.019	S.Fig legend	1s YFP_LC vs. 1sCheta_LC, t=3.6; 1s YFP_MS vs. 1S _MS_Cheta,t 0.50; 1s YFP_Ms vs. 1s _PVaCheta, t=0.71	Not reported
+ -	6e	One- way ANOVA	Fig. legend	15 events per animal	4 animals per condition	figure legend	Error bars are mean +/- SEM, SS (53.62± 5.38 N=4), YFP (59.21 ± 3.14 N=4), ArchT (117 ± 12.31 N=4)		p < 0.0001	figure legend (**)	t (3, 12)=21.45	not reported
+ -	6g	unpaired two-tailed Student's t-Test	figure legend	5 stimulation events per animal	4 animals per condition	figure legend	error bars are mean +/- SEM, YFP (0.0872 ± 0.005 N=4), ArchT (0.118 ± 0.006 N=4)		p=0.0052	figure legend (**)	t= 4.42	not reported
+ -	6h, right	unpaired two-tailed Student's t-Test	figure legend	5 stimulation events per animal	4 animals per condition	figure legend	error bars are mean +/- SEM, YFP (0.0169 ± 0.0017, N=4), ArchT (0.0137 ± 0.00179 N=4)		p=0.28	figure legend (n.s)	t= 1.16	not reported
+ -	3d 20 Hz	Wilcoxon signed rank test	MS	57	Firing rate of. 57 out of 70 recorded cells was reduced upon 20 Hz optogenetic stimulation	MS	mean +/- SEM	Fig. legend	p=1.62569845693310e-10	MS	-	-
+ -	3d on	unpaired two-tailed Student's t-Test	Not reported	17	17 of 17 tested cells reduced firing rate upon stimulation with 2 s continuous pulses	MS	mean +/- SEM	Fig. legend	p=0.0000014	Not reported	t(32,32)=5.89	not reported
+ -	3d	One- way ANOVA	Fig. Legend	70	Optostimulation led to a frequency-dependent decrease in the firing rate	Fig. legend	mean +/-	Fig. legend	p=9.42422748239997e-16	Fig. legend, Figure (*,***)	F(3,3)=38.2831	not reported
+ -	3e NREM	Wilcoxon signed rank test	not reported	46	Coefficient of firing rate variability (CV) of TRN cells across NREM sleep and wake states	Fig. Legend	mean +/- SEM	not reported	p=3,523e -09	Ms, Fig.legend, Figure (*)	-	-

+ -	3e 20Hz	Wilcoxon signed rank test	not reported	46	Coefficient of firing rate variability (CV) of TRN cells across NREM sleep and upon optogenetic activation of LHGABA-TRN circuit using stimulation at 20 Hz	Fig. Legend	mean +/- SEM	not reported	p=0.0086	Ms, Fig. legend, Figure (**)		
+ -	S7 g	Wilcoxon signed rank test	MS	10	Coefficient of firing rate variability (CV) of TRN cells across NREM sleep and upon optogenetic activation of LHGABA-TRN circuit using 2s pulses stimulation	Fig. Legend	mean +/- SEM	not reported	p=0.00195	Ms, Fig. legend, Figure (***)		
+ -	Results,page 4	t-test, two-tailed	MS	18	Normalized firing rates (Hz) in LH cells (n=18) during baseline (BL) and optostimulation with continuous pulses (1s)	Figure legend	mean +/- SEM	not reported	p=0.0306	Ms, Fig. legend, Figure (*)	t(17,17)=-2.359	Not reported
+ -	S3e	Binomial test	MS	13	Firing rates of LHGABA cells before and after wakening (n=13 cells, 0 -transition NREM sleep-wakefulness)	Figure legend	mean +/- SEM	Not reported	P=0.02	Main text, Fig legend	-	-
+ -	S5c NREM to wake 1Hz	unpaired two-tailed Student's t-Test	Figure legend	2,2	Graph representing summary data of the latency to wake from NREM sleep (> 10 events from 2 different animals per group).	Fig legend	66.7 +/- 6.67, n=10 ; ChETA: 46.4 +/- 14.6 (n=5)	Not reported	non significant	Not reported	-	-
+ -	S5c NREM to wake 20HZ	unpaired two-tailed Student's t-Test	Figure legend	2,2	Graph representing summary data of the latency to wake from NREM sleep (> 10 events from 2 different animals per group).	Fig legend	66.4 +/- 6.4 control (n=10); 106+/-13.4 (n=19)	Not reported	p= 0.002	Figure (*)	-	-
+ -	S5c NREM to wake 1s	unpaired two-tailed Student's t-Test	Figure legend	2,2	Graph representing summary data of the latency to wake from NREM sleep (> 10 events from 2 different animals per group).	Fig legend	61.2 +/- 4.38 control (n=4); 108 +/- 13.0 (n=9)	Not reported	p= 0.02	Figure (*)	-	-
+ -	page 5 PPR	paired two-tailed Wilcoxon test	test	5 pairs	peak values in PPR	5	Peak 1: -61.7 ± 12 pA; Peak 2: -54.53 ± 10.2 pA	page 5	P=0.187	not reported	-	-

Representative figures

1. Are any representative images shown (including Western blots and immunohistochemistry/staining) in the paper?

   If so, what figure(s)?

yes, see 2 for detailed description

2. For each representative image, is there a clear statement of how many times this experiment was successfully repeated and a discussion of any limitations in repeatability?

   If so, where is this reported (section, paragraph #)?

All primary figures (1-5) and supplemental figures s2 and s4 show representative current, voltage trace, extracellular spikes from individual neurons to show either direct or postsynaptic responses to blue light stimulation.
All figures 1a, 2a,b, 4b, s1a-f, s7a show representative pictures of Immunohistofluorescence or viral transfection from one animal that represent the average observation.
Figures 1b, 3b, 4c,d,and 5b,c represent EEG/EMG traces from one representative animal.
Raw traces:
Fig.2b, Auto-correlograms and spike waveforms, Fig.S4a, Fig.S4b, Fig.S4c are available for each recorded unit

Statistics and general methods

1. Is there a justification of the sample size?

   If so, how was it justified?

   Where (section, paragraph #)?

   Even if no sample size calculation was performed, authors should report why the sample size is adequate to measure their effect size.

Yes, all figures include clear statements regarding the number of cells/animals included in the experiment. For Fig. 1c, n is indicated on p. 3. For Fig. 3g-i, n is indicated on p 4. For Fig.42-h, n is indicated on p 6. For Fig. 5d-f, n is indicated on p 7. Figure 2d shows representative IPSCs from one cells (VGAT::IRES-Cre) with averaged current traces from 5 sweeps, however this evoked IPSCs were repeated in every cell recorded. We do mention, however, that not all light flashes resulted in an evoked IPSC . Supplemental figures 2b show representative traces that were repeated in 8 cells.
For the EEG/EMG representative traces showed in Fig 1b, 3b, 4c,d,and 5b,c, for each animal, the stimulation (either blue or yellow light) during a specific sleep state have been repeated at least 10 times per animal and per frequencies of stimulation in order to get an optimal average of the sleep state duration representative for each animal. The number of animal (n) and the number of time the stimulation has been apply are indicated in the figure legend.
For the immunohistofluorescence showed in Fig1a, 2a,b, 4b, s1a-f, s7a, the quantification of the number of cells/sections/animals is reported either in the text. The transfection pictures showed these figures are representative transfection observed regularly on Tg(VGAT::IRES)-Cre animals. No justifications are mentioned in the text.
Experimental sample size were defined based on previous studies. No statistical methods were used to pre-determine sample sizes.

2. Are statistical tests justified as appropriate for every figure?

   Where (section, paragraph #)?

Statistical tests are not justified, but are described for each test in the figure legend.

a. If there is a section summarizing the statistical methods in the methods, is the statistical test for each experiment clearly defined?

Yes there is a section summarizing statistical methodology in the methods, and t-tests and One-way ANOVA followed by posthoc tests are defined, except where otherwise noted.

b. Do the data meet the assumptions of the specific statistical test you chose (e.g. normality for a parametric test)?

Where is this described (section, paragraph #)?

Statistics for in vitro data were always tested for normality, and we detected no abnormalities in distribution across all in vitro electrophysiological and in vivo data tests.
In Vivo behavioral data distribution was assumed to be normal but this was not formally tested.
This is described in the online methods in the statistic section.

c. Is there any estimate of variance within each group of data?

Is the variance similar between groups that are being statistically compared?

Where is this described (section, paragraph #)?

Yes, variance was routinely described, and included as standard error of the mean (SEM). This is noted in figure captions, as well as methods section.

d. Are tests specified as one- or two-sided?

No, tests are not specified, but were always two-sided.

e. Are there adjustments for multiple comparisons?

Yes, we routinely used statistical adjustments for multiple comparisons (Student-Newman-Keuls).
α adjusted for multiple
comparisons in Fig 2d and S.Fig 2g

3. Are criteria for excluding data points reported?

Was this criterion established prior to data collection?

Where is this described (section, paragraph #)?

In vitro electrophysiological data was discarded if intrinsic cell properties were more than 3SDs outside group mean (ie. resting membrane potential, input resistance) and / or if recording stability changed by >15%, as measured through series resistance. This is described in the In vitro electrophysiology section.
Animal with no viral expression, abnormal sleep-wake cycle (3SD outside group mean) or optical fiber implants outside the target area were discarded from the study. This is described in the In vivo polysomnographic recordings section.

4. Define the method of randomization used to assign subjects (or samples) to the experimental groups and to collect and process data.

If no randomization was used, state so.

Where does this appear (section, paragraph #)?

A statement that Tg(VGAT::IRES)-Cre mice were randomly assigned to viral injection, a statement is included in the plasmid and viral targeting in the online methods.

5. Is a statement of the extent to which investigator knew the group allocation during the experiment and in assessing outcome included?

If no blinding was done, state so.

Where (section, paragraph #)?

In vitro electrophysiological and in vivo data was not collected blindly, however a statement was included in the text that Tg(VGAT::IRES)-Cre mice were randomly assigned to viral injection, a statement is included in the plasmid and viral targeting in the online methods. In vivo electrophysiological analysis was performed in a batch mode, simultaneously for control and experimental recordings.

6. For experiments in live vertebrates, is a statement of compliance with ethical guidelines/regulations included?

Where (section, paragraph #)?

Yes, experiments in live vertebrates complied with institutional and national guidelines and regulations, and this information is included on the mice section of the online methods.

7. Is the species of the animals used reported? Where (section, paragraph #)?	Yes, throughout the text.
8. Is the strain of the animals (including background strains of KO/ transgenic animals used) reported? Where (section, paragraph #)?	Yes, throughout the text. Original publication reported the used mouse line is indicated on the online methods in the animal section.
9. Is the sex of the animals/subjects used reported? Where (section, paragraph #)?	Yes, in the online methods in the mice section.
10. Is the age of the animals/subjects reported? Where (section, paragraph #)?	Yes, the online methods in the in vitro electrophysiology section specifies the age of animals for slice electrophysiology and in the in vitro polysomnographic recordings of the online methods for in vivo experiments.
11. For animals housed in a vivarium, is the light/dark cycle reported? Where (section, paragraph #)?	Yes, all experiments took place between 12-7PM in the text p5 and in the mice section of the online method.
12. For animals housed in a vivarium, is the housing group (i.e. number of animals per cage) reported? Where (section, paragraph #)?	Mice were housed in individual cage. See mice section in the Online Methods.
13. For behavioral experiments, is the time of day reported (e.g. light or dark cycle)? Where (section, paragraph #)?	Yes, all experiments took place between 12-7PM in the text p5 and in the mice section of the online method.
14. Is the previous history of the animals/subjects (e.g. prior drug administration, surgery, behavioral testing) reported? Where (section, paragraph #)?	Yes. The viral injection, the surgery and the ploysomnographic recording are described in their respective section in the online methods.
a. If multiple behavioral tests were conducted in the same group of animals, is this reported? Where (section, paragraph #)?	The animals transfected with ChETA were used for the stimulation during both NREM and REM sleep. This is mentioned in the online methods, optical stimulation section.
15. If any animals/subjects were excluded from analysis, is this reported? Where (section, paragraph #)?	This is reported in the in vivo recordings in the online methods.
a. How were the criteria for exclusion defined? Where is this described (section, paragraph #)?	in vitro electrophysiological data was discarded if intrinsic cell properties were more than 3SDs outside group mean (ie. resting membrane potential, input resistance) and / or if recording stability changed by >15%, as measured through series resistance. Sleep analysis was not performed blind to the conditions of the experiments. However, polysomnographic scoring was tested blindly by two independent scorers and was found to lie within a 95% confidence interval (described in the Online Methods in the Polysomnographic recording section).

b. Specify reasons for any discrepancy between the number of animals at the beginning and end of the study.

Where is this described (section, paragraph #)?

False positive animals could have been injected and /or implanted and when trough the entire process for in vitro or in vivo experiments. As mentioned in the online methods, after completion of the experiment, animals are perfused in order to check the viral expression and the position of the optic fiber. If one of this two conditions are judged not satisfactory, the animal was discarded from the experiment.

Reagents

1. Have antibodies been validated for use in the system under study (assay and species)?

All the antibodies have been validated for use in mice.

a. Is antibody catalog number given?

Where does this appear (section, paragraph #)?

the catalog number is reported in the immunohistochemistry sections of the online methods.

b. Where were the validation data reported (citation, supplementary information, Antibodypedia)?

Where does this appear (section, paragraph #)?

2. Cell line identity

a. Are any cell lines used in this paper listed in the database of commonly misidentified cell lines maintained by ICLAC and NCBI Biosample?

Where (section, paragraph #)?

b. If yes, include in the Methods section a scientific justification of their use--indicate here in which section and paragraph the justification can be found.

c. For each cell line, include in the Methods section a statement that specifies:

- the source of the cell lines
- have the cell lines been authenticated? If so, by which method?
- have the cell lines been tested for mycoplasma contamination?

Where (section, paragraph #)?

Data deposition

Data deposition in a public repository is mandatory for:

a. Protein, DNA and RNA sequences
b. Macromolecular structures
c. Crystallographic data for small molecules
d. Microarray data

Deposition is strongly recommended for many other datasets for which structured public repositories exist; more details on our data policy are available here. We encourage the provision of other source data in supplementary information or in unstructured repositories such as Figshare and Dryad.

We encourage publication of Data Descriptors (see Scientific Data) to maximize data reuse.

1. Are accession codes for deposit dates provided?

   Where (section, paragraph #)?

Computer code/software

Any custom algorithm/software that is central to the methods must be supplied by the authors in a usable and readable form for readers at the time of publication. However, referees may ask for this information at any time during the review process.

1. Identify all custom software or scripts that were required to conduct the study and where in the procedures each was used.

   Custom MATLAB functions were used to perform individual steps of data analysis, described in SI: Methods, Signal processing and data analysis.
   Sleep scoring was performed in Spike 5, using the Sleepscore v1.01 script. Source code can be obtained from the authors upon request.

2. If computer code was used to generate results that are central to the paper's conclusions, include a statement in the Methods section under "**Code availability**" to indicate whether and how the code can be accessed. Include version information as necessary and any restrictions on availability.

Human subjects

1. Which IRB approved the protocol?

   Where is this stated (section, paragraph #)?

2. Is demographic information on all subjects provided?

   Where (section, paragraph #)?

3. Is the number of human subjects, their age and sex clearly defined?

   Where (section, paragraph #)?

4. Are the inclusion and exclusion criteria (if any) clearly specified?

   Where (section, paragraph #)?

5. How well were the groups matched?

   Where is this information described (section, paragraph #)?

6. Is a statement included confirming that informed consent was obtained from all subjects?

   Where (section, paragraph #)?

7. For publication of patient photos, is a statement included confirming that consent to publish was obtained?

   Where (section, paragraph #)?

fMRI studies

For papers reporting functional imaging (fMRI) results please ensure that these minimal reporting guidelines are met and that all this information is clearly provided in the methods:

1. Were any subjects scanned but then rejected for the analysis after the data was collected?

   a. If yes, is the number rejected and reasons for rejection described?

      Where (section, paragraph #)?

2. Is the number of blocks, trials or experimental units per session and/or subjects specified?

   Where (section, paragraph #)?

3. Is the length of each trial and interval between trials specified?

4. Is a blocked, event-related, or mixed design being used? If applicable, please specify the block length or how the event-related or mixed design was optimized.

5. Is the task design clearly described?

   Where (section, paragraph #)?

6. How was behavioral performance measured?

7. Is an ANOVA or factorial design being used?

8. For data acquisition, is a whole brain scan used?

   If not, state area of acquisition.

   a. How was this region determined?

9. Is the field strength (in Tesla) of the MRI system stated?

    a. Is the pulse sequence type (gradient/spin echo, EPI/spiral) stated?

    b. Are the field-of-view, matrix size, slice thickness, and TE/TR/flip angle clearly stated?

10. Are the software and specific parameters (model/functions, smoothing kernel size if applicable, etc.) used for data processing and pre-processing clearly stated?

11. Is the coordinate space for the anatomical/functional imaging data clearly defined as subject/native space or standardized stereotaxic space, e.g., original Talairach, MNI305, ICBM152, etc? Where (section, paragraph #)?

12. If there was data normalization/standardization to a specific space template, are the type of transformation (linear vs. nonlinear) used and image types being transformed clearly described? Where (section, paragraph #)?

13. How were anatomical locations determined, e.g., via an automated labeling algorithm (AAL), standardized coordinate database (Talairach daemon), probabilistic atlases, etc.?

14. Were any additional regressors (behavioral covariates, motion etc) used?

15. Is the contrast construction clearly defined?

16. Is a mixed/random effects or fixed inference used?

    a. If fixed effects inference used, is this justified?

17. Were repeated measures used (multiple measurements per subject)?

    a. If so, are the method to account for within subject correlation and the assumptions made about variance clearly stated?

18. If the threshold used for inference and visualization in figures varies, is this clearly stated?

19. Are statistical inferences corrected for multiple comparisons?

    a. If not, is this labeled as uncorrected?

20. Are the results based on an ROI (region of interest) analysis?

    a. If so, is the rationale clearly described?

    b. How were the ROI's defined (functional vs anatomical localization)?

21. Is there correction for multiple comparisons within each voxel?

22. For cluster-wise significance, is the cluster-defining threshold and the corrected significance level defined?

Additional comments

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