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Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Research policies, see our Editorial Policies and the Editorial Policy Checklist.

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a	Confirmed	
☐	☒	The exact sample size (*n*) for each experimental group/condition, given as a discrete number and unit of measurement
☐	☒	A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
☐	☒	The statistical test(s) used AND whether they are one- or two-sided *Only common tests should be described solely by name; describe more complex techniques in the Methods section.*
☒	☐	A description of all covariates tested
☐	☒	A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons
☐	☒	A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals)
☐	☒	For null hypothesis testing, the test statistic (e.g. *F*, *t*, *r*) with confidence intervals, effect sizes, degrees of freedom and *P* value noted *Give P values as exact values whenever suitable.*
☒	☐	For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
☒	☐	For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes
☒	☐	Estimates of effect sizes (e.g. Cohen's *d*, Pearson's *r*), indicating how they were calculated

Our web collection on statistics for biologists contains articles on many of the points above.

Software and code

Policy information about availability of computer code

Data collection	Hot/Cold plate (Bioseb, Model LE 7406); Plantar Analgesia Meter Bioseb, Ethovision video tracking System (Noldus Information Technology, Wageningen); Packwin software (Panlab S.P, Cornella, Barcelona, Spain): Spike 2 software (Cambridge Electronic Design, Cambridge, UK); confocal microscope (Leica SPE, Mannheim, Germany).
Data analysis	Spike 2 software (Cambridge Electronic Design, Cambridge, UK); ImageJ free software (version 1.42q) NIH, Bethesda, MA); SigmaPlot 11.0 software (SigmaStat, Systat Software Inc, San Jose, CA, USA); GraphPad Software Prism 6.

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Research guidelines for submitting code & software for further information.

Data

Policy information about availability of data

All manuscripts must include a data availability statement. This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A list of figures that have associated raw data
- A description of any restrictions on data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☒ Life sciences ☐ Behavioural & social sciences ☐ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see nature.com/documents/nr-reporting-summary-flat.pdf

Life sciences study design

All studies must disclose on these points even when the disclosure is negative.

Sample size	No statistical methods were used to pre-determine sample sizes, but our sample sizes are similar to those reported in previous publications (Tan et al., Nat. Neuro., 20, pages1591–1601, 2017; Chen et al., Nat Commun., 9(1):1886, 2018; Calejesan et al., Eur. J. Pain 4, 83–96, 2000; Kang et al., Mol. Brain 8, 81, 2015))
Data exclusions	The sites of injection, and the viral expression were confirmed after every experiments. Mice displaying incorrect injection sites, or incorrect expression were excluded from the analysis.
Replication	Attempts of replication were successful. Replications were performed by different experimentors.
Randomization	Mice were assigned to groups randomly, ensuring similar starting body weights for each group.
Blinding	Experimentors were blinded to the type of mice, sections or samples being analysed in behavioral tests, morphological or biochemical experiments experiments.

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☐	☒ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology and archaeology
☐	☒ Animals and other organisms
☒	☐ Human research participants
☒	☐ Clinical data
☒	☐ Dual use research of concern

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Antibodies

Antibodies used	Primary antibodies: Goat anti-GFP IgG, ab104139, Abcam; sheep anti-TH IgG, AF7566-SP, RD System Bio Techne; mouse anti-synaptophysin IgG (clone SY38), Merck; rabbit anti-homer 1 antibody, #160 003, Synaptic System; rabbit anti-gephyrin antibody, #PA5-29 036, Invitrogen Thermo Fisher Scientific; mouse anti-CamK2alpha antibody, (6G3), #NB100-1983, Biotechne; rabbit anti-ERK 1/2 antibody, #NB110-96887, Novus Biological Biotechne; rabbit anti-pERK 1/2 antibody, #AF1018, R&D System Biotechne; rabbit anti-CREB antibody, #NBP1-90364, Biotechne; rabbit anti-pCREB antibody, #NB300-273, Novus Biological Biotechne; mouse anti-beta-actin antibody, (ACTBD11B7), #sc-81178, Santa Cruz Biotechnology. Secondary antibodies: Alexa Fluor 488, Donkey anti-goat antibody, #A-11055, Thermo Fisher Scientific; Alexa Fluor 488, Donkey anti-goat antibody, #A-11015, Thermo Fisher Scientific; Alexa Fluor 568, anti-rabbit antibody, #A-10042, Thermo Fisher Scientific; Alexa Fluor 488, anti-rabbit antibody, #A-21206, Thermo Fisher Scientific; goat anti-rabbit immunoglobulins HRP, G-21 234, Invitrogen Thermo Fisher Scientific; goat anti-mouse immunoglobulins HRP, G-21 040, Invitrogen Thermo Fisher Scientific.
Validation	Specificity of the antibodies was determined by the manufacturers and in our hands by omitting the primary antibodies. Preadsorption with purified antigen was performed when available.

Animals and other organisms

Policy information about studies involving animals; ARRIVE guidelines recommended for reporting animal research

Laboratory animals	Neonatal (P5) and young adult (8-14 weeks) Swiss mice bred in the animal facility of the Centre Broca-Nouvelle Aquitaine, University

	of Bordeaux (France), were used.
Wild animals	No wild animals were involved
Field-collected samples	No field-collected samples were used
Ethics oversight	Animal experimentation protocols were approved by the local ethics committee and the French Ministry of Agriculture under the reference APAFIS#13126C and APAFIS#11565.

Note that full information on the approval of the study protocol must also be provided in the manuscript.