

Reporting Summary

Nature Portfolio 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 Portfolio 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
<i>Only common tests should be described solely by name; describe more complex techniques in the Methods section.</i> |
| ☐ | ☒ | 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
<i>Give P values as exact values whenever suitable.</i> |
| ☒ | ☐ | 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 The Gene Expression Omnibus database (GEO database) was used to download the gene expression profiles for the GSE120642 dataset and GSE113873 dataset.

Data analysis Use weighted gene co-expression network analysis (WGCNA) and differential expressed gene (DEG) to analyze the expression data.

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 Portfolio [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 description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our [policy](#)

All source data is provided in a word file in supplementary material

Research involving human participants, their data, or biological material

Policy information about studies with [human participants or human data](#). See also policy information about [sex, gender \(identity/presentation\), and sexual orientation](#) and [race, ethnicity and racism](#).

Reporting on sex and gender N/A

Reporting on race, ethnicity, or other socially relevant groupings N/A

Population characteristics N/A

Recruitment N/A

Ethics oversight N/A

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

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](https://www.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 sample size studies were carried out. When ever possible at least 6 biological replicates were used. All sample sizes in all experiments and analysis are described in the manuscript.

Data exclusions No data was excluded

Replication All analysis were replicated

Randomization Random

Blinding Investigators were blinded for group allocation, data collection, and analysis.

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
☒	☐ Clinical data
☒	☐ Dual use research of concern
☒	☐ Plants

Methods

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

Antibodies

Antibodies used HK2 (#A0165; ABclonal), PFKFB3 (#13763-1-AP; Proteintech), PKM2 (#15822-1-AP; Proteintech), LDHA (#19987-1-AP; Proteintech), VEGFA (#19003-1-AP; Proteintech), VEGFR2 (#A5609; ABclonal), p-VEGFR2 (#2478S; Cell Signaling Technology), FAK (#A11131; ABclonal), p-FAK(8556S; Cell Signaling Technology), PI3K(#4257S; Cell Signaling Technology), p-PI3K(#4228S; Cell Signaling Technology)

Technology), ERK(#4695S; Cell Signaling Technology), p-ERK(#4370S; Cell Signaling Technology), SIRT2 (#A25817; ABclonal), actin (#sc-47778; Santa Cruz Biotechnology), H3K9la (#PTM-1419RM; PTM Biolabs), H3K14la (#PTM-1414RM; PTM Biolabs), H3K18la (#PTM-1406RM; PTM Biolabs), H3K27la (#PTM-1428; PTM Biolabs), H4K5la (#PTM-1407RM; PTM Biolabs), H4K8la (#PTM-1415RM; PTM Biolabs), H4K12la (#PTM-1411RM; PTM Biolabs), H4K16la (#PTM-1417RM; PTM Biolabs), H3 (#PTM-1001RM) ; PTM Biolabs), H4 (#PTM-1015RM; PTM Biolabs), Pan-klα (#PTM-1401RM; PTM Biolabs), Pan-kac (#PTM-101; PTM Biolabs), rabbit anti-H3K18la antibody (#PTM-1427RM; PTM Biolabs) or rabbit IgG isotype control (#AC005; ABclonal), rabbit anti-HK2 (1:100, #22029-1-AP; Proteintech), goat anti-CD31 (1:200, #AF3628; R&D Systems) and rabbit anti-H3K18 (1:100, #PTM-1406RM; PTM Biolabs), Alexa Fluor 594 goat anti-rabbit IgG (1:500, #ab150080; Abcam); Alexa Fluor 594 donkey anti-goat IgG (1:500, #ab150132; Abcam); Alexa Fluor 488 donkey anti-goat IgG (1:500, #ab150129; Abcam)

Validation

Describe the validation of each primary antibody for the species and application, noting any validation statements on the manufacturer's website, relevant citations, antibody profiles in online databases, or data provided in the manuscript.

Eukaryotic cell lines

Policy information about [cell lines and Sex and Gender in Research](#)

Cell line source(s) Human Umbilical Vein Endothelial Cells (HUVECs) were obtained from the American Type Culture collection IATcc Manassas.VA, USA).

Authentication Authentication procedure was used

Mycoplasma contamination HUVECs were tested negative for mycoplasma contamination

Commonly misidentified lines (See [ICLAC](#) register) N/A

Animals and other research organisms

Policy information about [studies involving animals](#); [ARRIVE guidelines](#) recommended for reporting animal research, and [Sex and Gender in Research](#)

Laboratory animals C57BL/6 mice (10–12 weeks old)

Wild animals N/A

Reporting on sex Male sex was included in the study.

Field-collected samples Mice were group-housed in a room with a 12-hour light-dark cycle and were allowed ad libitum access to water and standard laboratory chow. They were monitored daily throughout the study

Ethics oversight The experimental protocol was approved by the Ethics Committee of Central South University (Approval ID: 202401002). All procedures strictly adhered to standard animal experimentation protocols and were conducted in compliance with the ARRIVE guidelines.

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

Plants

Seed stocks N/A

Novel plant genotypes N/A

Authentication N/A