

Reporting Summary

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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

ImageJ 18.0

Data analysis

Microsoft Excel 2013

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/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 supporting the findings of this study are available in the paper and its supplementary information files or from the corresponding authors upon reasonable request. All specimens illustrated in this paper are deposited in Nanjing Institute of Geology and Palaeontology (accession numbers NIGP-166252 to NIGP-169870), with the exception of NIGP-169869, which is currently left on the outcrop (30°47'9.5" N, 111°02'57.6" E) at Wuhe village in Yichang, Hubei Province, China. Extended Data Figure 3 have associated raw data, which are provided in Data Source.

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

Ecological, evolutionary & environmental sciences study design

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

Study description	Palaeontological study of early animal fossils collected from the terminal Ediacaran Shibantan Member of the Dengying Formation in the Yangtze Gorges area in Hubei Province, China. Total number of specimens was 48. Measurement were repeated 3 times.
Research sample	Fossil specimens were collected from the Shibantan Member of the Dengying Formation at Wuhe village (GPS coordinates 30°47'10"–30°47'27" N, 111°02'47"–111°03'23" E), Hubei Province, China. All specimens illustrated in this paper are repositied in Nanjing Institute of Geology and Palaeontology (accession numbers NIGP-166252 to NIGP-169870), with the exception of NIGP-169869, which is currently left on the outcrop (30°47'9.5" N, 111°02'57.6" E) at Wuhe village in Yichang, Hubei Province, China.
Sampling strategy	All specimens encountered in the excavation were collected and studied. A total of 48 specimens of Yilingia and related trace fossils were collected. This sample size is deemed sufficient in paleontological investigations. No sample size calculation was performed.
Data collection	Fossil specimens were photoed using Nikon D700 and D850 cameras. Measurements were made directly on specimens or on photographs of specimens using ImageJ and recorded by Zhe Chen.
Timing and spatial scale	Fossils were collected in 2013–2018 from stratigraphic horizons about 0.5–10 m above the base of the Shibantan Member at the Wuhe section (GPS coordinates 30° 47'10"–30°47'27" N, 111°02'47"–111°03'23" E) in the Yangtze Gorges area of South China
Data exclusions	No data were excluded from analysis.
Reproducibility	Each specimens was measured 3 times and all attempts at replication were successful.
Randomization	Our study did not require randomization because it did not involve experiments.
Blinding	Our study did not require blinding because it did not involve experiments.
Did the study involve field work?	☒ Yes ☐ No

Field work, collection and transport

Field conditions	The field site is located in the subtropical zone. Climate is humid in the field season (summer time). Outcrops are well exposed. Excavation was required to remove slab of fossil specimens.
Location	Located at Wuhe, Yichang, Hubei Province in South China (GPS coordinates 30° 47'10"–30°47'27" N, 111°02'47"–111°03'23" E)
Access and import/export	Collection of fossil specimens was carried out in a responsible manner and in compliance with the local, national and international laws. All specimens illustrated in this paper are repositied in Nanjing Institute of Geology and Palaeontology (accession numbers NIGP-166252 to NIGP-169870), with the exception of NIGP-169869, which is currently left on the outcrop (30°47'9.5" N, 111°02'57.6" E) at Wuhe village in Yichang, Hubei Province, China.
Disturbance	Disturbance was minimized by controlled excavation. Reclamation of excavation quarries will be carried out after the research project is completed.

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
☒	☐ Animals and other organisms
☒	☐ Human research participants
☒	☐ Clinical data

Methods

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

Palaeontology

Specimen provenance	Shibantan Member, Wuhe village (GPS coordinates 30° 47'10"–30°47'27" N, 111°02'47"–111°03'23" E), Hubei Province, China. Collection permits were not needed.
Specimen deposition	All specimens illustrated in this paper are repositied in Nanjing Institute of Geology and Palaeontology (accession numbers NIGP-166252 to NIGP-169870), with the exception of NIGP-169869, which is currently left on the outcrop (30°47'9.5" N, 111°02'57.6" E) at Wuhe village in Yichang, Hubei Province, China.
Dating methods	Published U-Pb dates (Extended Data Fig. 1b) and stratigraphic correlation with terminal Ediacaran strata in Namibia (Linnemann et al., 2019) are used to constrain the age of the fossils.
☒ Tick this box to confirm that the raw and calibrated dates are available in the paper or in Supplementary Information.	