

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 3D shape and morphometric data were acquired using Artec Studio 11 Professional.

Data analysis PAST 3.12 and SPSS version 25 statistics software were used for principal component, cluster, and Mann-Whitney U analyses. Reconstruction of endocranial volume was performed using Avizo 9.7, Edgewarp and Mathematica 11. Phylogenetic analysis was performed using MrBayes v3.2.6.

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 character matrix upon which our phylogenetic analysis is based has been digitally archived and is available at <http://morphobank.org/permalink/?P3477>. The craniometric data upon which our principal component and cluster analyses are based is available in spreadsheet format in Supplementary Information.

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)

Ecological, evolutionary & environmental sciences study design

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

Study description	Description and analysis of a new fossil hominin cranium from the Drimolen Main Quarry paleoanthropological site.
Research sample	Focal specimen DNH 155.
Sampling strategy	DNH 155 was primarily compared to the entire <i>Paranthropus robustus</i> collections housed at the Transvaal Museum and the University of the Witwatersrand. This comprises the world's entire collection of fossils of this species.
Data collection	DNH 155 was excavated by Samantha Good, Angeline Leece, Stephanie Baker and Andy Herries in June, 2018. It was reconstructed by Jesse Martin between June and December, 2018, and analyzed by David Strait, Jesse Martin, Angeline Leece, Simon Neubauer, Gary Schwartz and Carrie Mongle between June 2018 and January 2020. Geological and stratigraphic context were provided by Andy Herries and Giovannia Boschian.
Timing and spatial scale	DNH 155 was recovered during the June 2018 field season.
Data exclusions	No data were excluded.
Reproducibility	No experiments were performed.
Randomization	No experiments were performed.
Blinding	No experiments were performed.
Did the study involve field work?	☒ Yes ☐ No

Field work, collection and transport

Field conditions	Paleontological excavation in the sedimentary infill of a karst cave. Ecological conditions under which fossils were recovered are not relevant to the research.
Location	Specimen DNH 155 was recovered from in situ fully and partially decalcified breccia deriving from the central talus cone of the Drimolen Main Quarry (DMQ) deposits. The DMQ is located within the Fossil Hominid Sites of South Africa UNESCO World Heritage Site, known locally as the Cradle of Humankind, in South Africa's Gauteng Province. DMQ is within the n'Gomo Safari Lodge, west of Kromdraai Road and north of the Blaubank Stream. The coordinates of DNH 155 and the entire DMQ locality are 25° 58' 07" S 27° 45' 21" E.
Access & import/export	Any fossils recovered from paleoanthropological sites in South Africa must by law be deposited with the Evolutionary Studies Institute of the University of the Witwatersrand, and we have done so. DNH 155 was excavated under a permit issued by the South African Heritage Resources Agency (SAHRA) to Stephanie Baker and Andy Herries. Permit ID 2597 was issued on 8 Sept., 2017, and ran through 30 June, 2018 (covering our entire field season). Our permit has since been renewed (ID 2883, issued on 19 March 2019 and extending to 31 March 2022).
Disturbance	Drimolen Main Quarry is located within a defunct quarry, and thus our activities do not add to ecological disturbance. In accordance with South African statutes, our excavated sediments are bagged and used for stabilisation purposes.

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

Palaeontology and Archaeology

Specimen provenance	Specimen DNH 155 was recovered from in situ fully and partially decalcified breccia deriving from the central talus cone of the Drimolen Main Quarry (DMQ) deposits. The DMQ is located within the Fossil Hominid Sites of South Africa UNESCO World Heritage Site, known locally as the Cradle of Humankind, in South Africa's Gauteng Province. DMQ is within the n'Gomo Safari Lodge, west of Kromdraai Road and north of the Blaubank Stream. The coordinates of DNH 155 and the entire DMQ locality are 25° 58' 07" S 27° 45' 21" E.
Specimen deposition	Evolutionary Studies Institute of the University of the Witwatersrand
Dating methods	The date of the sedimentary unit containing DNH 155 has already been published (Herries et al. 2020 Science 368, eaaw7293).
☐ Tick this box to confirm that the raw and calibrated dates are available in the paper or in Supplementary Information.	
Ethics oversight	Paleontological excavation in South Africa is governed by the South African Heritage Resources Agency.

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