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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 Authors & Referees 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	We used the Cogent toolbox (version 2000) and MATLAB (versions from 2010-2014) to collect data
Data analysis	Data analysis was performed using MATLAB, JASP, R and the hBayesDM toolbox for R (Data, analyses and scripts available here osf.io/2jx87). Multiple versions of software used but will replicate on Matlab 2014, R 3.5 and JASP 0.9

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

Data, analyses and scripts available here osf.io/2jx87

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

Behavioural & social sciences study design

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

Study description	Quantitative experimental
Research sample	We recruited 132 participants, N=88 healthy controls (50 female; age=23±5) and N=44 with unmedicated mood and anxiety symptoms (28 female; age=28±9) from the local community (i.e. not through clinical services, but rather through advertisements on noticeboards and internet sites; this was to increase the probability of recruiting unmedicated participants). The two groups were recruited through separate advertising campaigns. The symptomatic group responded to an advert asking for people for whom anxiety/depression was impacting their lives, and then underwent a standardized clinical screen. The groups did not significantly differ in gender (X2=0.65, p=0.5) but the patient group was slightly older (mean ages: 29 vs 23; t(130)=4.4, p<0.001,d=0.8 [95% CI 0.4, 1.2]). Although our focus was on anxiety symptoms, we recruited a mixed sample because mood and anxiety disorder symptoms show considerable overlap, and the disorders are strongly comorbid indicating that they may not be mechanistically dissociable. The majority of our pathological sample (N=28) had a mixed diagnosis of Generalised Anxiety Disorder (GAD) and Major Depressive Disorder (MDD); eight had GAD diagnosis alone; three had panic disorder with MDD; and five had MDD alone (These diagnoses were assigned according to the Mini International Neuropsychiatric Interview (MINI) and completed by a trained researcher under the guidance of a clinical psychologist or psychiatrist)26. The average number of depressive episodes was 5 (SD±7), with the average onset of first episode 20±8 years. All were currently unmedicated, but N=18 had tried psychiatric medication more than 6 months prior to the experiment, and N=21 had undergone some form of psychological treatment. Exclusion criteria were any form of psychiatric medication within the last 6 months, any current psychiatric diagnosis (other than major depression or anxiety disorder), neurological disorder, or pacemaker. Continuous measures of anxiety symptomatology were obtained using the State-Trait Anxiety Inventory (STAI) and recent depression symptoms using the Beck depression inventory (BDI). All participants provided written informed consent and were reimbursed £7.50/ hour for participation. Demographics: Control Symptomatic Total N 88 44 % female 57 64 Age 23±5 28±9 Anxiety 41±11 57±8 Depression 7±7 20±9
Sampling strategy	We set an a priori minimum group size of N=40 in the original grant application (MR/K024280/1) based on a previously observed difference between groups of effect size d=1.0924, which was decreased to 0.7 for the purpose of a conservative power analysis. The final N=44 in the clinical group and N=88 in the healthy group, provides >95% power for a between-groups t-test with $\alpha = 0.05$ (two-tailed). Ultimately we wanted to collect as much data as possible within our time and financial constraints, as parameter recovery in modelling is dependent upon sample size. Critically, model comparison and inference was only completed after we stopped recruitment.
Data collection	Data was collected using a laptop computer. The participant and researcher were present. The researcher collecting data was not blind to group allocation or condition but was blind to hypothesis.
Timing	Healthy control sample data collected 04/02/2014 - 29/05/2015 Clinical sample 23/03/2015 -03/02/2016
Data exclusions	No data were excluded
Non-participation	No participants dropped out.
Randomization	Patients and controls were assigned to groups on the basis of clinical screening.

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

Human research participants

Policy information about studies involving human research participants

Population characteristics	see above
Recruitment	Community healthy and clinical samples recruited from central London. All clinical samples screened for mood and anxiety disorders. It is representative of the local community who are willing to participate in experimental research (thus may not be representative of a sample who is not willing to participate in research).
Ethics oversight	The study obtained ethical approval from the UCL Research Ethics Committee (Project ID Numbers: 1764/001 and 6198/001).

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