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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	Behavioral data was collected using custom Matlab scripts based on Psychtoolbox. Concurrent neural data was collected using a commercial Yokogawa MEG system or commercial clinical EEG systems used by the Epilepsy centers (Natus Medical Incoporated).
Data analysis	All stimuli was constructed and data analyzed using custom Matlab and R scripts written by the first author. Source reconstruction of MEG data was based on scripts from the Fieldtrip toolbox.

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 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

Life sciences study design

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

Sample size	Sample sizes were taken in accordance to the standard published and acceptable size in the field of research.
Data exclusions	Data exclusions occurred only if the participant did not perform the task or data quality was so low it could not be analyzed (due to artifacts), such cases are detailed in the Methods.
Replication	Our findings replicated across three modalities (psychophysics, MEG, ECoG). In the case of MEG we provide two datasets replicating the main effect of temporal correlations but not spectral correlations due to task differences. We have also replicated the main MEG experiment in a sub-population (6 participants) with a separate MEG system providing the same results (unpublished).
Randomization	There was no randomization according to group or control groups. All statistics are within subjects or across subjects but not comparing one group to another. In all experiments each participant listened to a different random order of speech stimuli (combination of filter, speaker and sentence). This randomization process ensured a random order of stimuli for each participant while reducing priming effects within block (e.g. for both speaker identity as well as sentence content, a high cutoff filter never appeared before a lower cutoff filter for that stimulus). In experiments 1-4, the order of tasks and response hand were counter balanced across participants (within experiment).
Blinding	Data collection and analysis were not performed blind to the conditions of the experiments. Blinding was not relevant to the study as there was no comparison of treatment vs. control group.

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	For MEG and behavioral paradigms subjects were recruited from the NYU community and characteristics represent the overall population in the New York metropolitan area as well as New York University. Subjects with a history of neurological conditions or any metal implants were not included in the study. For the ECoG experiment, patient characteristics represent the overall patient cohort at NYU Langone Medical Center and North Shore University Hospital with refractory Epilepsy.
Recruitment	For MEG and behavioral paradigms subjects were recruited using fliers in the University, students in the Psychology department and previous subjects in MEG experiments at NYU. For the ECoG experiment, patients were recruited if they were undergoing neurosurgery for refractory epilepsy for clinical purposes and volunteered to participant in research during their planned hospital stay. In both cases there can be a self-selection bias to the healthy population at NYU and the epileptic population that would undergo neurosurgical treatment.
Ethics oversight	The study protocol was approved by the NYU Committee on Human Research for all MEG and behavioral data collection and analysis. In a separate protocol, NYU approved the analysis of anonymized ECoG data acquired at the hospital. ECoG data collection was approved by the NYU Langone Medical Center Committee on Human Research for NYU Langone ECoG patients. Stereotactic and ECoG data collection was approved by the North Shore University Hospital Committee on Human Research for North Shore University Hospital patients.

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