nature portfolio

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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 *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	N/A
Data analysis	N/A

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

The datasets generated and analyzed during the current study are proprietary and not publicly available.

Human research participants

Policy information about studies involving human research participants and Sex and Gender in Research.

Reporting on sex and gender	Sex was determined based on self-reported data provided by the participants.
Population characteristics	Population characteristics is provided in table 1.
Recruitment	39 ambulatory participants with FRDA (Age = 26.8 ± 1.6 years old, body-mass-index (BMI) = 22.9 ± 0.7, average disease duration = 13.6 ± 1.1 years) were recruited at the Children's Hospital of Philadelphia/ Perelman School of Medicine at the University of Pennsylvania (Philadelphia, PA, USA) – See Table 1 for participants demographics, clinical, and biological characteristics. Inclusion and exclusion criteria are provided in the supplementary materials.
Ethics oversight	All subjects provided written informed consent, and the corresponding Institutional Review Board approved the study (protocol 2609) in accordance with to the Declaration of Helsinki.

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

Behavioural & social sciences study design

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

Study description	This study is quantitative in nature and utilizes a cross-sectional design. It primarily focuses on assessing the relationship between sensor-derived physical activity metrics and established clinical scores in patients with Friedreich's ataxia (FRDA). Wearable devices, including a pendant sensor, were used to continuously monitor and record various aspects of physical activity and motor functions.
Research sample	39 ambulatory participants with FRDA (Age = 26.8 ± 1.6 years old, body-mass-index (BMI) = 22.9 ± 0.7, average disease duration = 13.6 ± 1.1 years) were recruited at the Children's Hospital of Philadelphia/ Perelman School of Medicine at the University of Pennsylvania (Philadelphia, PA, USA) – See Table 1 for participants demographics, clinical, and biological characteristics. Inclusion and exclusion criteria are provided in the supplementary materials.
Sampling strategy	A convenience sampling strategy was followed as the sampling involves selecting participants based on their availability and proximity to the researchers at the Children's Hospital of Philadelphia/ Perelman School of Medicine at the University of Pennsylvania (Philadelphia, PA, USA).
Data collection	Appropriate information has been provided in the Method section.
Timing	Appropriate information has been provided in the Method section.
Data exclusions	No data was excluded from the analysis.
Non-participation	N/A
Randomization	N/A

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

Methods

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

Clinical data

Policy information about clinical studies

All manuscripts should comply with the ICMJE guidelines for publication of clinical research and a completed CONSORT checklist must be included with all submissions.

Clinical trial registration	NCT06016946
Study protocol	The study received approval from the Institutional Review Board as a sub-study of CHOP IRB 2609, Friedreich Ataxia Clinical Outcome Measures, in accordance with the Declaration of Helsinki.
Data collection	All data collection was done at the Children's Hospital of Philadelphia/ Perelman School of Medicine at the University of Pennsylvania (Philadelphia, PA, USA)
Outcomes	Outcomes are provided in the supplementary table 1 an 2.