

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
<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 Data were collected with standard video-cameras

Data analysis Data were analyzed with custom code implemented in Python and Matlab

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](#)

All data and codes supporting the findings of this study are available at the following Zenodo repository (<https://doi.org/10.5281/zenodo.19592341>). It contains the full anonymized trajectory data for each experiment (including all experimental conditions), the source data files (Excel) used to construct the figures and the Python scripts that reproduce all manuscript figures and statistical tests from SourceData.xlsx and ExperimentalData.zip.

Research involving human participants, their data, or biological material

Policy information about studies with [human participants or human data](#). See also policy information about [sex, gender \(identity/presentation\), and sexual orientation](#) and [race, ethnicity and racism](#).

Reporting on sex and gender

Sex was considered as a descriptive variable in this study. The sex of each participant was self-reported, either via a questionnaire or verbally, prior to data collection; it was not assigned or inferred by the researchers. Across all experiments, the proportion of male and female participants is reported for descriptive purposes. Data disaggregated by sex are presented exclusively in Fig. 8, where the distribution of participants by sex is shown. No sex-based statistical analysis was carried out in the other experiments, as the study focuses on pedestrian locomotor dynamics rather than on differences between sexes. No gender analysis was carried out, as gender was not a relevant variable for the research questions addressed. Informed consent for the collection and publication of individual-level data, including sex, was obtained from all participants.

Reporting on race, ethnicity, or other socially relevant groupings

Race and ethnicity were not collected in this study. The study examines pedestrian movement dynamics and individual locomotor bias; race and ethnicity were not relevant variables for the research questions addressed, and their collection was not part of the study design. No analyses involving race, ethnicity, or other socially constructed groupings were carried out.

Population characteristics

We kindly collect only basic demographic details—specifically participants' age and gender.

Recruitment

Depending on the study, participants were recruited either through a dedicated webpage, an online form shared on social media, or by volunteering directly without any prior registration.

Ethics oversight

University of Navarra, University of Tokyo and University of Kyoto.

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

Six independent experimental campaigns were conducted to identify the mechanisms that generate the systematic counter clockwise rotational bias observed in pedestrian dynamics. Each campaign isolated a candidate driver, ranging from purely physical interactions in confined domains to culturally mediated walking conventions. For every participant we computed individual angular velocity and net rotation from trajectories obtained with high spatial and temporal precision.

Research sample

The volunteer population differed from one experiment to the next, reflecting the specific aims and logistical settings of each campaign.

Experiment 1: Confined random motion in Spain

Indoor arena in the University of Navarra. 50 adults, mean age 25.7 ± 4.1 yr; 23 male and 27 female.

Experiment 2: Teenagers in a Spanish schoolyard

Secondary-school courtyard in the city of Pamplona. 107 secondary students aged 13 to 14 yr.

Experiment 3: Confined random motion in Japan

Indoor arena in the University of Tokyo. 39 adults, mean age 26.8 ± 7.4 yr.

Experiment 4: Nursery school cohort

Data from Ichikawa et al. (PLOS ONE 16 e0246041 2021) collected in Tokyo. 11 children aged 5 yr.

Experiment 5: Individual motion

Indoor arena in the University of Navarra. 209 students and staff members, 88 male and 121 female.

Experiment 6: Social norm elicitation

University of Navarra classrooms. 168 university students.

Sampling strategy

Depending on the experiment, participants were deliberately selected to realise the specific experimental condition under investigation. To secure statistical robustness, each condition was repeated between 2 and 7 times. In Experiment 1, for example, 11 distinct conditions were implemented, each repeated 6 times, yielding 66 different trials to analyze; analogous replication schedules

	were adopted in the remaining campaigns, with full details available on the Supplementary Information File.
Data collection	Experiments 1 to 4. Top-view or lateral-view cameras recorded pedestrians' trajectories. Custom computer-vision software provided their positions and velocities. Experiment 6 and the walking-preference sub-test in Experiment 3. Participants completed structured paper questionnaires.
Timing	Experiments 1 to 4. Single sessions of approximately 3 to 4 h. Experiment 5. Two consecutive days with 4 h per day; each volunteer took part for about 1 min and they could leave after that. Experiment 6. Parallel sessions in two rooms, total duration 15 min.
Data exclusions	No data were excluded from the analysis.
Non-participation	Participation was voluntary in all campaigns and no enrolled participant declined to take part. In Experiment 2 (with teenagers), no parent objected to their son or daughter taking part in the experiment.
Randomization	Participants were not allocated into experimental groups.

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
☒	☐ Plants

Methods

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

Plants

Seed stocks	<i>Report on the source of all seed stocks or other plant material used. If applicable, state the seed stock centre and catalogue number. If plant specimens were collected from the field, describe the collection location, date and sampling procedures.</i>
Novel plant genotypes	<i>Describe the methods by which all novel plant genotypes were produced. This includes those generated by transgenic approaches, gene editing, chemical/radiation-based mutagenesis and hybridization. For transgenic lines, describe the transformation method, the number of independent lines analyzed and the generation upon which experiments were performed. For gene-edited lines, describe the editor used, the endogenous sequence targeted for editing, the targeting guide RNA sequence (if applicable) and how the editor was applied.</i>
Authentication	<i>Describe any authentication procedures for each seed stock used or novel genotype generated. Describe any experiments used to assess the effect of a mutation and, where applicable, how potential secondary effects (e.g. second site T-DNA insertions, mosaicism, off-target gene editing) were examined.</i>