

Investigating the analytical robustness of the social and behavioural sciences

<https://doi.org/10.1038/s41586-025-09844-9>

Received: 27 January 2025

Accepted: 31 October 2025

Published online: 1 April 2026

 Check for updates

The same dataset can be analysed in different justifiable ways to answer the same research question, potentially challenging the robustness of empirical science^{1–3}. In this crowd initiative, we investigated the degree to which research findings in the social and behavioural sciences are contingent on analysts' choices. We examined a stratified random sample of 100 studies published between 2009 and 2018, in which, for one claim per study, at least five reanalysts independently reanalysed the original data. The statistical appropriateness of the reanalyses was assessed in peer evaluations, and the robustness indicators were inspected along a range of research characteristics and study designs. We found that 34% of the independent reanalyses yielded the same result (within a tolerance region of ± 0.05 Cohen's *d*) as the original report; with a four times broader tolerance region, this indicator increased to 57%. Of the reanalyses conducted, 74% reached the same conclusion as the original investigation, 24% yielded no effects or inconclusive results and 2% reported the opposite effect. This exploratory study indicates that the common single-path analyses in social and behavioural research should not be simply assumed to be robust to alternative analyses⁴. Therefore, we recommend the development and use of practices to explore and communicate this neglected source of uncertainty.

Over the past decade, social and behavioural scientists have been striving to enhance the robustness, objectivity and replicability of their findings through systemic reforms in the conduct and communication of empirical research. Practices such as preregistration⁵, registered reports⁶, multisite replications⁷, analytical reproducibility checks^{8,9} and automated result validation techniques¹⁰ have been investigated and recommended to produce robust and replicable findings. An important aspect of robustness has yet to be systematically charted across these sciences: the contingency of the results on researchers' analytical choices.

In a typical research pipeline, the collected empirical data are analysed by a single analyst or team, and the published report presents a conclusion on the basis of one analytical path, occasionally accompanied by a few robustness tests. The peer review process aims to ensure that the analysis approach meets the relevant statistical and field-specific standards. However, this procedure does not systematically ascertain whether justifiable alternative analytical choices could have led to different results.

Theories and empirical designs rarely constrain analysts to a single analytical path. Many degrees of freedom exist in how researchers operationalize their variables, process their data, construct their statistical models, select algorithms and software for model estimation and define their inference criteria, whether they follow frequentist, Bayesian or likelihoodist analytical approaches; use machine learning; or conduct computational modelling to answer the same research question^{1,4}. This inherent freedom of the analyst constitutes the so-called analytical variability contained within empirical projects, a key component in the robustness of the statistical results. In practical terms, it is the manifested variation among the choices independent scientists consider justified. Figure 1 presents some sources of analytical

variability that can manifest themselves in analysts' statistical results and the conclusions drawn from the results.

One way to explore analytical variability is to use a multiverse methodology^{2,11}, in which analysts conduct all combinations of analytical choices they are able to generate across a wide range of reasonable scenarios. Alternatively, in the multi-analyst approach, several analysts analyse the data following their best judgement. The latter approach requires more organization, but it takes advantage of alternative expert perspectives without the combinatorial expansion of the number of results. A multi-analyst approach also examines naturally occurring variation, empirically answering the counterfactual question of what might have happened if another investigator had considered the same research question using the same data.

Multi-analyst projects^{3,12–24} have provided some evidence of the extent to which analysts' individual choices influence results and conclusions. From economics to neuroscience, these explorations have demonstrated that the robustness of empirical findings can be compromised by researcher degrees of freedom²⁵. The estimates of previous multi-analyst studies suggest that the variability in effect-size estimates attributable to analytical heterogeneity can exceed the variability one would expect owing to sampling error²⁶.

Do we know how robust published findings are to analytical choices across the social and behavioural sciences? One could argue that multi-analyst projects so far have been purposefully conducted in research areas with little consensus on the best analytical approach or were motivated to demonstrate the potential effects of analytical choices and, therefore, may represent rare cases in which alternative analyses produce important differences in results. For example, the datasets selected may have afforded researchers greater degrees of freedom than is typical, raising issues about the generalizability of

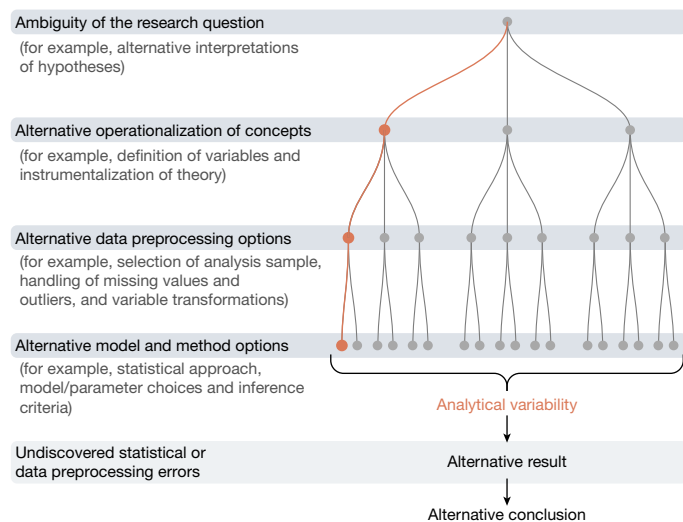


Fig. 1 | Main sources of analytical variability. Analytical variability can arise from the ambiguity of the research question, alternative operationalizations of concepts, variations in data preprocessing options, model and method choices and undiscovered statistical or data processing errors.

the findings to scientific research more broadly. Differences between academic methodologies and fields also seem plausible. For example, relatively simple experiments sometimes used in social psychology and behavioural economics may contain fewer analytical decisions than the complex longitudinal observational datasets used in macroeconomics and finance, and therefore may be more analytically robust in general²². To the extent that this is the case, findings from the existing multi-analyst projects could be biased towards worst-case scenarios, and the traditional analytical practice and review system may not require fundamental adjustments. If, on the other hand, observed results are contingent on the analyst's choices across fields, methodologies and types of dataset, then the scientific literature could be less robust than is often assumed. If so, the general practices of how we conduct, report and review empirical analyses should be reformed to address this source of uncertainty.

After conducting 504 reanalyses with the involvement of 457 independent reanalysts on a stratified random sample of 100 social and behavioural studies, we conducted strictly exploratory analyses to describe the patterns in the findings. Inspecting the results across different research characteristics and study designs gives rise to a number of hypotheses for future research on how to maximize transparency and address this often-neglected component of scientific uncertainty.

Variability of the results

To explore the robustness of published claims, we selected a key claim from each of our 100 studies, in which the authors provided evidence for a (directional) effect. We presented each empirical claim to at least five analysts along with the original data and asked them to analyse the data to examine the claim, following their best judgement, and report only their main result. The analysts were encouraged to analyse studies where they saw the greatest relevance of their expertise. Therefore, in this study, analytical variability, as a key component of robustness, is defined as the variation among the analytical results when different analysts are provided with the same research questions and data.

First, we explored the degree to which the reanalysts produced the same statistics in the reanalysis of each study. We found that in 81% of the studies, the corresponding analysts reported different statistics about statistical test families (such as *t*-tests, *F*-tests and χ^2 tests) and their values (after rounding them to two decimal places).

A challenge in any multi-analyst project is to find a common metric that allows the results of the different analyses to be compared. A practical solution is to transform the reported point estimates into a standard effect-size measure. Although these transformations have limitations and their calculation relies on assumptions that may not hold in all considered analysis settings^{25–28}, for the sake of comparability, we decided to compute Cohen's *d* for each reanalysis, wherever it was feasible (for an alternative approach, see Supplementary Fig. 1). The methods, materials, analysis plan, peer evaluation and data management strategy of the project were preregistered on the Open Science Framework (OSF) repository of the project (<https://osf.io/q5h2c>) (deviations from the registered plan are reported and explained in 'Deviations from preregistration' in the Supplementary Information). In our preregistration, we defined two results as qualitatively the same when their effect sizes are within the tolerance region of ± 0.05 Cohen's *d*. However, we also present analyses with alternative tolerance regions. Our results revealed how far the new estimates were from the original ones (Fig. 2a) and how often the effect sizes of the reanalyses fell within this tolerance region (Fig. 2i).

We found that in 5% (5 out of 95) of the studies for which we could obtain the original effect size, all reanalysis effect sizes were inside the tolerance region (± 0.05 Cohen's *d*) of the result of the original study (Fig. 2a). Of the 396 available reanalysis effect sizes, 34% were inside the tolerance region. As a robustness test of our analysis, we explored the degree to which we would observe different results with different tolerance regions. With a four times broader tolerance region (± 0.20 Cohen's *d*), in 23% of the studies, all corresponding reanalysis results were inside the tolerance region. Further, of the 396 available reanalysis effect sizes, 57% (224) were within this region (Extended Data Fig. 1a).

Alternatively, we could define the tolerance region as the percentage of the given effect size. As a further robustness test, we varied the tolerance region between $\pm 5\%$ and $\pm 20\%$, but it made barely any difference to the percentage of robust studies (Extended Data Fig. 1b).

We next considered whether these robustness results vary by study discipline, design, expertise of the analysts, their prior familiarity with the data or sample size in the data. Figure 2b,c presents the results for the major disciplines in our sample (ten or more studies). For Fig. 2c, we created an effect-size estimate range for each study as the numerical difference between the highest and lowest estimates of reanalysis effect sizes. In our reading, the listed disciplines do not yield large differences in the robustness of the results. Still, it is reasonable to think that the level of analytical robustness in different disciplines can be influenced by the types of study commonly conducted. For example, one could conjecture that empirical claims on the basis of observational data show lower robustness of the conclusions because they probably involve more researcher degrees of freedom in terms of viable analysis paths than experimental research settings. Figure 2d,e explores this question and indicates that the results of studies with observational study designs have lower analytical robustness in our sample, relative to experimental designs (Supplementary Tables 5 and 6).

Considering the analytical variability found in the statistical results of the reanalyses, one immediate concern is that it could be an artefact of a lack of analytical expertise among some reanalysts. Therefore, we explored whether our robustness results exhibit a different pattern when examined in relation to the self-reported statistical expertise of the reanalysts. Visual inspection of Fig. 2f shows no support for this proposition, because a higher level of expertise corresponds with no increase or decrease in the ratio of the reported results being different from the original ones. It is noteworthy, however, that the level of self-perceived expertise was clustered at the higher end of the scale.

Reanalysing published studies entails a potential risk of bias if the reanalysts' familiarity with a given study influences their choice of analysis. Reanalysts reported that they were familiar with the original study in only 8% of cases. Moreover, there was no more than 3% difference in robustness between those who were and those who were

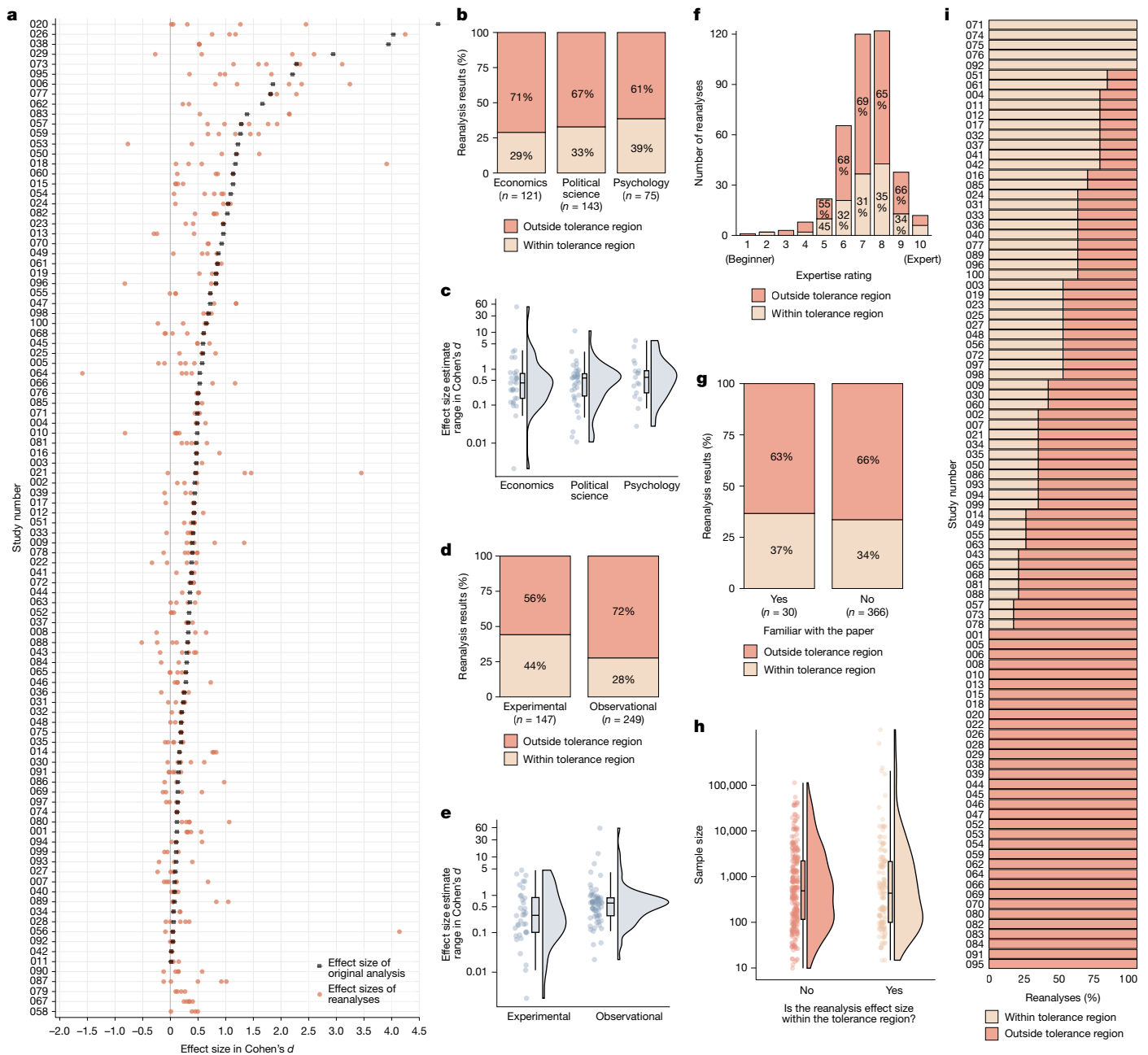


Fig. 2 | Analytical robustness of the statistical results. **a**, Effect size of the original analysis (grey squares; all represented as positive values) and the effect sizes of the reanalyses (red dots) for each study. The figure displays 415 reanalysis effect-size estimates that were convertible to Cohen's *d* and excludes effect sizes outside the [-2, 4.5] range. For the five studies listed at the bottom of the figure, we could not determine the original effect size because of missing information. Study numbers correspond to the studies listed at <https://osf.io/mkwhn>. The studies are ordered by the original effect size. **b**, Percentage of reanalysis results falling within or outside the tolerance region of the original results of the studies by major disciplines. The figure displays the count of reanalyses next to each discipline name. **c**, Distributions of effect-size estimate ranges calculated per study for each major discipline. **d**, Proportion of reanalysis

not familiar with the original study (Fig. 2g). For both groups, around two-thirds of the estimates fell outside our tolerance region. Finally, we were interested to see whether these robustness results would show a different pattern when considering sample size, as one could assume that studies with larger sample sizes could offer more robust results. Figure 2h does not support this assumption, because the density distributions of the sample sizes for results that are within and outside

results falling within or outside the tolerance region of the original results of the studies by study type. The figure displays the count of reanalyses next to each discipline name. **e**, Distribution of effect-size estimate ranges calculated per study for observational and experimental studies. **f**, Percentage of reanalysis results falling within or outside the tolerance region of the original results of the studies by self-rated expertise (1, beginner; 10, expert). **g**, Percentage of reanalysis results falling within or outside the tolerance region of the original results of the studies by declared familiarity with the study. **h**, Distribution of sample sizes separately for reanalysis effect sizes falling within or outside the tolerance region of the original results. **i**, Proportion of effect sizes falling within the preset tolerance range (± 0.05 Cohen's *d*) for each study.

of the tolerance region are virtually the same. Therefore, studies with large sample sizes are not immune to analytical variability.

We next asked whether the reanalyses show a trend or shift in effect sizes compared with the results of the original studies. If the reanalysis effect sizes randomly vary around the original effect size, we would expect that they are larger or smaller than the original ones with an equal chance. Figure 3a,b (reanalysis data trimmed at Cohen's $d \leq 5$

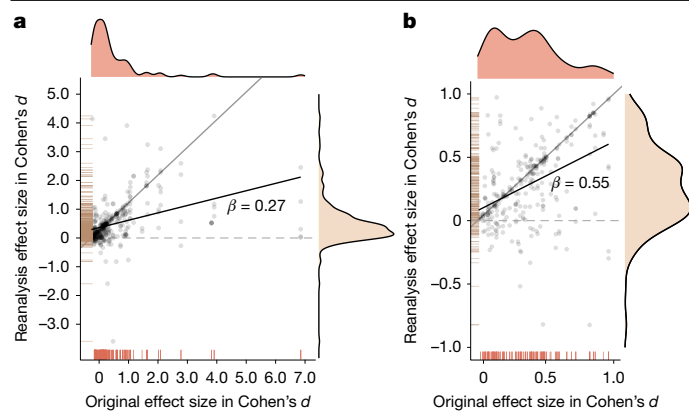


Fig. 3 | Original study effect size versus reanalysis effect size. The thin diagonal line represents the ideal case in which the reanalysis effect sizes are equal to the original effect size, whereas the thick line shows the best-fitting (least-squares) line of the displayed dots. Density plots of original ($n = 95$) and reanalysis ($n = 504$) effect sizes are parallel to their respective axes. β refers to the regression slope. **a** shows the effect sizes with Cohen's $d \leq 5$, whereas **b** shows the same for effect sizes with Cohen's $d \leq 1$.

and $d \leq 1$, respectively) indicates that reanalysis effect sizes show a tendency to be smaller than the original effect sizes, as reflected in their best-fitting (least-squares) line. The distribution of original and reanalysis effect sizes also supports this, because the peak of the density distribution of the latter is markedly lower. The original results showed a mean effect size of 0.73 (median = 0.43), whereas the reanalysis yielded a mean effect size of 0.49 (median = 0.35), with Cohen's d calculated for d values ≤ 5 . This result is consistent with the possibility that the original authors were biased towards reporting larger effects than the reanalysts, that the reanalysts were biased towards reporting smaller effects than the original analysts, or both.

Variability of the conclusions

Another focal question of our study was whether the reanalysts reached the same qualitative conclusions as the original study analysts. To answer this question, we asked the reanalysts to implement any statistical reanalysis they deemed most appropriate to test the original claim using the original data, with the goal of arriving at a single conclusion. Across all individual reanalyses ($n = 504$), 74% of analyses arrived at the same conclusion as the original investigation, 24% yielded no effects or inconclusive results and 2% indicated an effect in the opposite direction from the original investigation (Fig. 4a).

Of 100 reanalysed claims, 34% were robust to independent reanalysis, such that all reanalysts reported that they found evidence for the originally reported claim. However, this result is contingent on the level of agreement we use to define analytically robust findings. With a more liberal definition of analytical robustness, this value was 39% when analytical robustness was defined as greater than 80% reanalysis agreement with the original conclusion, and it was 80% when this definition was greater than 50%. The results with alternative levels of agreement are displayed in Fig. 4j.

We examined whether these results show a different pattern when we inspected them along the previously mentioned aspects of the analyses. Figure 4b,c presents the proportions of conclusions that were robust in each of the listed disciplines. As in the analyses of the robustness of the statistical results, the listed disciplines do not manifest large differences in robustness of the conclusions, whereas their robustness may be influenced by the study designs most common in a given field or subfield. Figure 4d supports this notion, as it indicates that nearly half of the conclusions from experimental studies remained robust upon independent reanalysis, whereas less than one-third of

observational studies yielded robust conclusions. Moreover, Fig. 4e indicates that, although most of the reanalyses for both study designs reached the same conclusions as the original study, the figure was 13% higher for experimental studies than for observational studies. As with the robustness of the results, we can ask whether the deviation from the originally reported claim in terms of conclusions is explained by the reanalysts' lack of analytical expertise. Figure 4f shows no support for this conjecture when evaluating the pattern of results as a function of self-reported statistical expertise. The same conjecture can be assessed by considering the quality of the submitted statistical analyses that were evaluated by peer evaluators on a subset of the analyses (Methods). Figure 4g shows that the proportion of inferentially robust conclusions is numerically larger for analyses that were rated as medium quality by peer evaluators than for analyses that were rated as high quality. Whether this pattern was a result of noise or whether more sophisticated analyses are characterized by greater heterogeneity in approaches and results should be the topic of future metascientific projects.

As with the analyses of the robustness of the statistical results, we were interested to see whether these results showed a different pattern when we inspected them as a function of the analysts' prior familiarity with the dataset. Although those familiar with the original study reported the same conclusion in a higher proportion than those who were not familiar, 17% of their reanalyses still indicated a conclusion different from the original (Fig. 4h).

Again, we aimed to explore whether these robustness results would show a different pattern when we considered sample size. As presented in Fig. 4i, the density distribution corresponding to the analyses with the different conclusion types shows a comparable spread, suggesting that the conclusions of studies with smaller and larger sample sizes seem to be similarly contingent on analytical choices.

For descriptive information about the reanalysts, peer evaluators and further robustness analyses, see Extended Data Figs. 2–4 and Supplementary Information (general descriptives, demographics of the reanalysts, peer evaluation and robustness analysis sections).

Limitations

This study has a number of limitations. First, our collection of 100 articles represents only a tiny fraction of all the empirical studies in the social and behavioural disciplines. Despite our efforts to select a representative sample of published articles across disciplines from the investigated time period, we excluded studies for which the underlying data were not obtainable and when our screening attempt to analytically reproduce the original results following the published procedures failed. We cannot exclude the possibility that these prerequisites, in addition to the self-selection of the analysts, led to sampling bias.

Although we conducted more than 500 analyses, our project included only five independent analyses for most datasets. Therefore, we do not know to what degree these analyses capture the full variability of analyses and results for the given research question and dataset. In addition, because we reanalysed already published studies and the reanalysts were provided with these studies, the original analysis pipeline could have anchored some of the choices of the reanalysts. On the other hand, some analysts may have been motivated to produce alternative results, given the basic scientific incentive to present something new.

Although Cohen's d has the advantage of being easy to compute and comparable across different analyses, Kumpel and Hoffmann²⁹ recently proposed the concept of generalized marginal effects, an effect size metric that is both formally applicable and comparable across different statistical models. We had not originally planned to calculate standardized generalized marginal effects and, accordingly, did not collect all required analysis outputs to compute them across the board. Still, we calculated generalized marginal effects for a sample of our studies to showcase their potential for future multi-analyst studies (Supplementary Fig. 1).

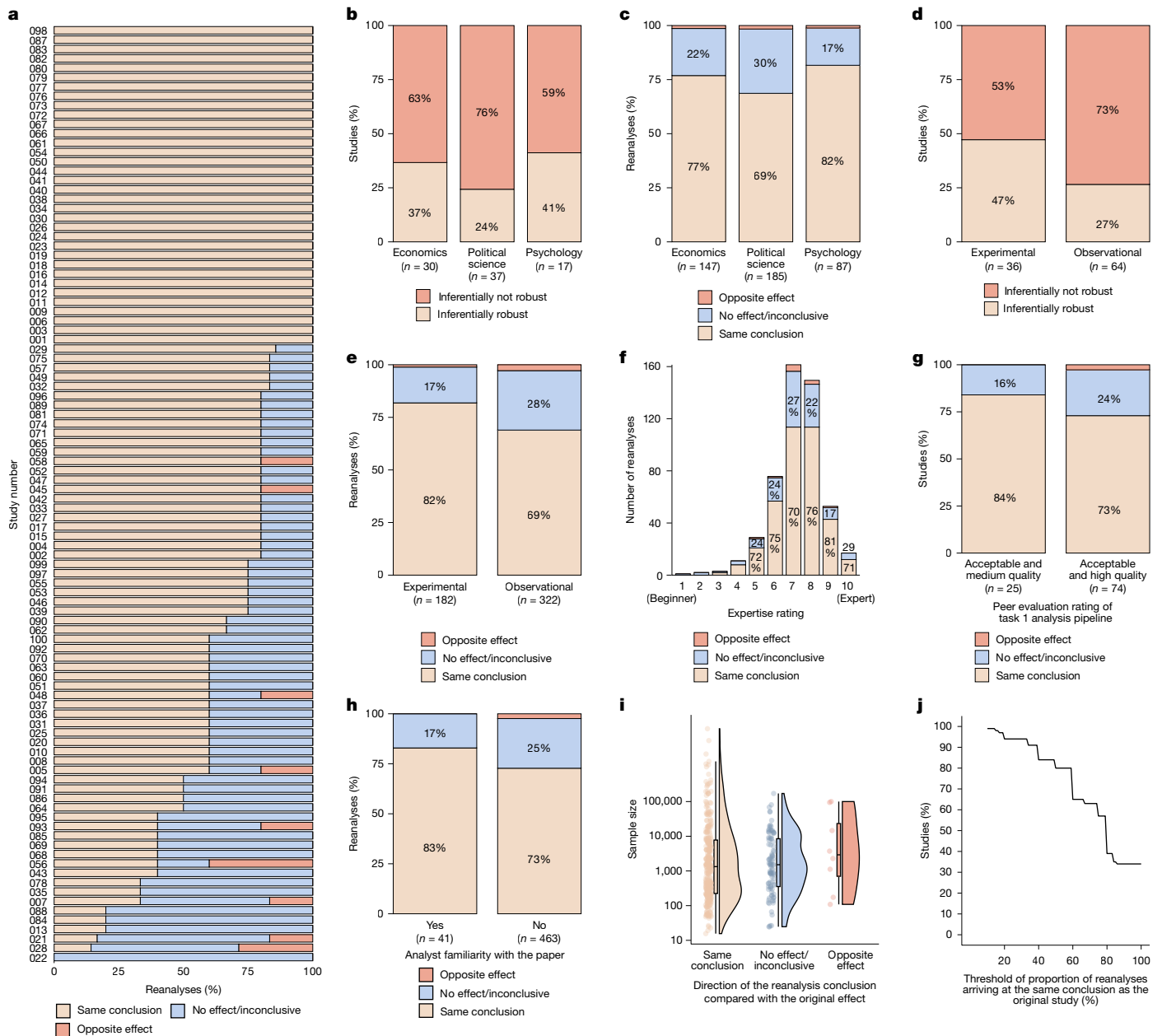


Fig. 4 | Analytical robustness of the conclusions. **a**, Proportion of analyses reaching the same conclusion, yielding no effect/inconclusive results and indicating an opposite-direction conclusion for each study. Study numbers correspond to the studies listed at <https://osf.io/mkwhn>. **b**, Proportion of inferentially robust results (all reanalyses arrived at the same conclusion for the given study) by major disciplines (more than ten studies in our collection: economics, political science and psychology). **c**, Proportion of analyses showing the same effect, no effect/inconclusive results and conclusions in the opposite direction to the original studies by major discipline. The number of reanalyses is displayed below each discipline. **d**, Proportion of inferentially robust results by study design (experimental versus observational). The number of reanalyses is given below each study design. **e**, Proportion of analyses showing the same conclusion, no effect/inconclusive results and opposite effect to the reanalyses by study type (experimental or observational).

f, Proportion of analyses showing the same conclusion, no effect/inconclusive results and opposite effect by self-rated expertise (on a scale of 1 (beginner) to 10 (expert)). **g**, Proportion of inferentially robust studies by the acceptability of the analysis pipelines according to the peer evaluators. For this panel, we included only studies with more than one peer evaluation and in which the peer evaluators agreed on their rating. This panel shows only the rating options with five or more reanalyses in that category. **h**, Proportion of analyses showing the same conclusion, no effect/inconclusive results and opposite effect by declared familiarity with the study. **i**, Distribution of sample size for reanalyses resulting in the same conclusion, no effect/inconclusive results and opposite effects. Sample size values were available for 345 reanalyses. **j**, Percentage of studies with robust conclusions above different levels of reanalysis consensus. Reanalysis consensus refers to the agreement among the conclusions drawn by the original study and the independent reanalyses.

We have presented some exploratory analyses, but there are many other factors to explore that could contribute to analytical variability (such as topical expertise). Finally, despite our best efforts to conduct quality checks on the reanalyses to ensure the soundness of the analytical strategies¹⁶, it is possible that some of the discrepancies between the

original and new results are attributable to weaknesses in the reanalysts' approach rather than to equally justifiable alternative analysis decisions. It is likewise possible that there are weaknesses in the original analysts' approaches. It is unknown whether the quality control processes for the reanalysts resulted in better, worse or similar overall quality

of analysis decisions as compared with the quality control processes for the original analysts' decisions. The declared statistical expertise of the reanalysts makes us believe that the observed heterogeneity in analyses and outcomes is a good representation of variation in informed analysis decision-making in social-behavioural research.

Discussion

Are published results in the social and behavioural sciences robust to independent reanalyses? The present exploration shows considerable variability owing to researcher degrees of freedom in statistical choices. Overall, when independent researchers analysed the same research question on the original data, 34% of studies remained robust to independent reanalysis in the sense that all reanalysts arrived at the same conclusion as the original analyst or analyst team. Notably, the new conclusions converged with the original ones in 74% of the individual reanalyses. Our descriptive results indicate a number of hypotheses concerning the circumstances in which we could expect greater analytical variability.

Why there can be several answers

Faced with the variability in the analysts' effect-size estimates and conclusions, one intuitive hypothesis is that the variation must be attributable to researcher characteristics, such as statistical or field-specific knowledge. Previous multi-analyst studies found little to no effect of researcher-specific characteristics, such as experience in the field or statistical expertise^{16,19,27}. Instead, they suggest that analytical results are dependent on the particular choices that the analysts make among similarly acceptable data processing and analysis choices²⁷. For example, when 46 independent analyst teams analysed the same speech dataset to answer the same research question, the authors concluded that "depending on the choice of how the speech signal is operationalised, researchers might find evidence for or against a theoretically relevant prediction" (p. 21)²⁷.

In line with previous findings, our results showed no strikingly different patterns across self-reported statistical expertise and experience in a matching field (Fig. 2f, Extended Data Fig. 4 and Supplementary Tables 5–9). At the same time, a few analysts who reported being familiar with the original article produced alternative results and conclusions at a comparable rate. Our peer evaluation process did not indicate that the analytical variability of the reanalyses was attributable to inadequate statistical practices. These results are in line with those of Menkveld et al.²², in which the quality assessment of the proposed analysis pipelines did not statistically explain the results.

Another line of thought would suggest that the lack of robustness in the original published results reflects some conceptual ambiguity in the theories or methodology³⁰. Research hypotheses are often short verbal expressions that do not force the specifications of the analyses. The underspecification of claims³¹ could represent a main source of ambiguity in analytical decisions. We could not test the role of hypothesis ambiguity in a controlled manner, but it is a plausible contributor, considering that social science theories often make general claims across many variables, creating theory-laden choice points about how constructs are operationalized and how hypotheses are tested³².

In terms of methodology, we examined our results by separating them by experimental and observational study designs. We observed that the proportions of results and conclusions that were analytically robust were 15–20% higher in the experimental studies. The estimated range of effect sizes was also apparently wider for observational studies than experimental studies. This exploratory finding motivates the hypothesis that the increased control over data collection circumstances and the reduced number of variables in experimental versus observational research translate to more limited analytical flexibility. However, substantial statistical variability remained among the findings from experimental studies.

Why these findings matter

In cases in which several acceptable analytical paths exist, researchers can use this freedom opportunistically^{33,34} and bias the results towards desired findings ('myside bias'³⁵). The much-discussed credibility challenges in the social and behavioural sciences stem partly from the suspicion that the prevailing incentive systems for publication encourage researchers to report and interpret empirical data to serve non-epistemic goals, such as storytelling³⁶. Reform initiatives, such as the preregistration of research and analysis plans, aim to decrease researcher degrees of freedom to tweak the analytical method or the research question to the observed data. Would results in these fields become markedly more credible if every study was preregistered? Because preregistration is a protection against overfitting, we suggest that it would reduce or eliminate the observed finding that original analyses showed stronger evidence for positive results than reanalyses. However, we also suggest that preregistration would have little impact on the observed heterogeneity across alternative analysis strategies, because registering and following a single analytical path constrains the analysts only from choosing opportunistically from the alternative analytical paths. Still, it does not confer any unique statistical or epistemic status to the preselected analytical path²⁶. Unexplored but alternative justifiable analyses applied to the same data could still lead to very different results. This exploration is clear about the presence of this variability in approaches, results and inferences in the social and behavioural sciences. Without exploring this variability, authors cannot guarantee consumers of their research that the reported conclusions hold a privileged status over alternative conclusions.

What we can do

The outcomes of this project suggest that the empirical answers to research questions in the social and behavioural sciences depend on the analytical paths taken to pursue them. Therefore, we advocate for the broader adoption of approaches that explore, recognize and address the uncertainty created by analytical variability.

Two main types of solution are (1) multi-analyst studies, such as our own, in which several investigators independently follow their own approach; and (2) the multiverse^{2,11,37} approach, in which one investigator or team performs numerous analyses across a set of reasonable pipelines. Conducting exploratory studies to identify analytical uncertainties and holding out samples are further advisable practices to tackle analytical variability.

Project leaders aiming to conduct multi-analyst studies can consult various tutorial papers and guidelines. Aczel et al.³⁸ provide an expert consensus guideline on the entire life cycle of multi-analyst projects, from recruiting suitable analysts through conducting the project to the reporting of the outcomes. Kumpel and Hoffmann²⁹ offer a framework for synthesizing objective outcome metrics. The Subjective Evidence Evaluation Survey³⁹ is a tool for systematically exploring and quantifying subjective measures of evidence in multi-analyst studies, allowing analysis teams to subjectively reflect on various aspects of evidence, such as coherence, robustness and relevance, as well as the quality of the research design and data.

Multiverse analysis is also useful, especially when the dataset cannot be shared with other research groups for confidentiality reasons or when there are insufficient human resources to recruit several independent analysts. Several guideline papers help researchers to conduct and interpret such analyses^{2,37,40–42}.

Recently, many scholars have called for a stronger focus on replication in science⁴³. Similar to preregistration, however, replications are unlikely to help address the robustness of results to several analysis strategies, because they intentionally repeat the same (or at least a very similar) analysis path. In this sense, replications can help to detect bodies of work in which authors may have leveraged their researcher

degrees of freedom to generate results that are in line with their own or the journal's expectations. All other things being equal, a severely *P*-hacked literature should contain fewer replicable findings. However, replicability does not eliminate analytical variability itself. Nevertheless, having several studies creates an opportunity to observe whether analytical variability is itself replicable. For example, imagine that study A provides evidence for a claim with analysis 1 but not with analysis 2. If several replications also find evidence for the claim with analysis 1 but not with analysis 2, then the analytical choices are directly implicated in how evidence for the phenomenon is observed. However, if it is random across replications whether analysis 1 or 2 provides evidence for the claim, then the implications of the analytical variability are very different. The combination of replications and robustness investigations will facilitate the advancement of stronger theoretical underpinnings of the topics of study and could reduce analytical variability in the long run by creating a more direct mapping between theory and measurement^{11,30}.

Overall, we argue that the scholarly communication system could foster more engagement with systematic and transparent robustness testing. As a starting point, the research data shared openly alongside codebooks and analysis scripts are a prerequisite for any assessment of analytical robustness. Research findings of particular scientific or societal importance could be accompanied by robustness reports⁴⁴ that summarize the results of alternative theory-motivated analytical choices by independent analysts. This publication format already provides a platform for analysts to scrutinize the fragility of the findings before they have a major impact on scholarship and policy (see <https://scipost-staging.org/JRobustRep>).

What we learned about robustness

Our results support the view that results in social and behavioural science studies are contingent on the analysts' choices, and if the analysts report a single result from a single analytical path, they have not exhausted the possible answers that the dataset can provide. This finding aligns with the conclusions drawn by Wagenmakers et al.⁴ that the belief that "for any dataset, there exists a single, uniquely appropriate analysis procedure" and "multiple plausible analyses would reliably yield similar conclusions" (p. 424) are no more than statistical myths. Without multi-analyst and multiverse approaches, the fragility of empirical findings remains.

Nonetheless, we emphasize that an optimistic or pessimistic interpretation is a matter of perspective and greatly depends on what evidential support we expect from a given study. Therefore, whether a result is satisfyingly robust will always depend on our epistemic needs and the precision we expect from our results. We caution against using blanket rules in aggregating or interpreting results across different analytical approaches within the same investigation.

Objectivity is a fundamental ideal of science, implying that claims about the world should not be contingent on the predispositions of the claimant. What our results reveal is not that we must distrust or reject the results of the past, including the studies we analysed. Instead, they suggest that we should adopt greater caution about the evidence that single analytical paths can offer to support social and behavioural science claims. We believe that the limitations of 'single-shot' analyses cut across numerous scientific disciplines. Methodological innovations, such as multi-laboratory collaborations, multi-analyst approaches and multiverse methods, could increase the robustness of the social and behavioural sciences and, perhaps more broadly, other empirical fields.

Online content

Any methods, additional references, Nature Portfolio reporting summaries, source data, extended data, supplementary information, acknowledgements, peer review information; details of author contributions

and competing interests; and statements of data and code availability are available at <https://doi.org/10.1038/s41586-025-09844-9>.

- Silberzahn, R. & Uhlmann, E. L. Crowdsourced research: many hands make tight work. *Nature* **526**, 189–191 (2015).
- Patel, C. J., Burford, B. & Ioannidis, J. P. Assessment of vibration of effects due to model specification can demonstrate the instability of observational associations. *J. Clin. Epidemiol.* **68**, 1046–1058 (2015).
- Botvinnik-Nezer, R. et al. Variability in the analysis of a single neuroimaging dataset by many teams. *Nature* **582**, 84–88 (2020).
- Wagenmakers, E.-J., Sarafoglou, A. & Aczel, B. One statistical analysis must not rule them all. *Nature* **605**, 423–425 (2022).
- Nosek, B. A., Ebersole, C. R., DeHaven, A. C. & Mellor, D. T. The preregistration revolution. *Proc. Natl Acad. Sci. USA* **115**, 2600–2606 (2018).
- Chambers, C. What's next for registered reports? *Nature* **573**, 187–189 (2019).
- Coles, N. A., Hamlin, J. K., Sullivan, L. L., Parker, T. H. & Altschul, D. Build up big-team science. *Nature* **601**, 505–507 (2022).
- Brodeur, A., Dreber, A., Hoces de la Guardia, F. & Miguel, E. Replication games: how to make reproducibility research more systematic. *Nature* **621**, 684–686 (2023).
- Brodeur, A., Mikola, D. & Cook, N. Mass reproducibility and replicability: a new hope. *SSRN Electron. J.* <https://doi.org/10.2139/ssrn.4790780> (2024).
- Nuijten, M. B. & Polanin, J. R. "statcheck": automatically detect statistical reporting inconsistencies to increase reproducibility of meta-analyses. *Res. Synth. Methods* **11**, 574–579 (2020).
- Steege, S., Tuerlinckx, F., Gelman, A. & Vanpaemel, W. Increasing transparency through a multiverse analysis. *Perspect. Psychol. Sci.* **11**, 702–712 (2016).
- Bastiaansen, J. A. et al. Time to get personal? The impact of researchers choices on the selection of treatment targets using the experience sampling methodology. *J. Psychosom. Res.* **137**, 110211 (2020).
- Hoogeveen, S. et al. A many-analysts approach to the relation between religiosity and well-being. *Religion Brain Behav.* **13**, 237–283 (2022).
- Salganik, M. J. et al. Measuring the predictability of life outcomes with a scientific mass collaboration. *Proc. Natl Acad. Sci. USA* **117**, 8398–8403 (2020).
- Schweinsberg, M. et al. Same data, different conclusions: radical dispersion in empirical results when independent analysts operationalize and test the same hypothesis. *Organ. Behav. Hum. Decis. Process.* **165**, 228–249 (2021).
- Silberzahn, R. et al. Many analysts, one data set: making transparent how variations in analytic choices affect results. *Adv. Methods Pract. Psychol. Sci.* **1**, 337–356 (2018).
- Starns, J. J. et al. Assessing theoretical conclusions with blinded inference to investigate a potential inference crisis. *Adv. Methods Pract. Psychol. Sci.* **2**, 335–349 (2019).
- Veronese, M. et al. Reproducibility of findings in modern PET neuroimaging: insight from the NRM2018 grand challenge. *J. Cereb. Blood Flow Metab.* **41**, 2778–2796 (2021).
- Brezna, N. et al. Observing many researchers using the same data and hypothesis reveals a hidden universe of uncertainty. *Proc. Natl Acad. Sci. USA* **119**, e2203150119 (2022).
- Huntington-Klein, N. et al. The influence of hidden researcher decisions in applied microeconomics. *Econ. Inq.* **59**, 944–960 (2021).
- Trübutschek, D. et al. EEGManyPipelines: a large-scale, grassroots multi-analyst study of electroencephalography analysis practices in the wild. *J. Cogn. Neurosci.* **36**, 217–224 (2024).
- Menkveld, A. J. et al. Nonstandard errors. *J. Finance* **79**, 2339–2390 (2024).
- Sarstedt, M. et al. Same model, same data, but different outcomes: evaluating the impact of method choices in structural equation modeling. *J. Prod. Innovation Manage.* **41**, 1100–1117 (2024).
- Schilling, K. G. et al. Tractography dissection variability: what happens when 42 groups dissect 14 white matter bundles on the same dataset? *Neuroimage* **243**, 118502 (2021).
- Gelman, A. & Loken, E. *The Garden of Forking Paths: Why Multiple Comparisons Can Be a Problem, Even When There Is No "Fishing Expedition" or "p-Hacking" and the Research Hypothesis Was Posited Ahead of Time* https://sites.stat.columbia.edu/gelman/research/unpublished/p_hacking.pdf (Columbia Univ., 2013).
- Holzmeister, F. et al. Heterogeneity in effect size estimates. *Proc. Natl Acad. Sci. USA* **121**, e2403490121 (2024).
- Coretta, S. et al. Multidimensional signals and analytic flexibility: estimating degrees of freedom in human-speech analyses. *Adv. Methods Pract. Psychol. Sci.* **6**, 25152459231162567 (2023).
- van Assen, M. A., Stoevenbelt, A. H. & van Aert, R. C. The end justifies all means: questionable conversion of different effect sizes to a common effect size measure. *Religion Brain Behav.* **13**, 345–347 (2023).
- Kümpel, H. & Hoffmann, S. A formal framework for generalized reporting methods in parametric settings. Preprint at <https://arxiv.org/abs/2211.02621> (2022).
- Auspurg, K. & Brüderl, J. Has the credibility of the social sciences been credibly destroyed? Reanalyzing the "Many Analysts, One Data Set" project. *Socius* **7**, 23780231211024421 (2021).
- Scheel, A. M. Why most psychological research findings are not even wrong. *Infant Child Dev.* **31**, e2295 (2022).
- Oberauer, K. & Lewandowsky, S. Addressing the theory crisis in psychology. *Psychon. Bull. Rev.* **26**, 1596–1618 (2019).
- Brodeur, A., Cook, N. & Heyes, A. Methods matter: p-hacking and publication bias in causal analysis in economics. *Am. Econ. Rev.* **110**, 3634–3660 (2020).
- Simmons, J. P., Nelson, L. D. & Simonsohn, U. False-positive psychology: undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychol. Sci.* **22**, 1359–1366 (2011).
- Stanovich, K. E. *The Bias That Divides Us: The Science and Politics of Myside Thinking* (MIT, 2021).
- Gernsbacher, M. A. Rewarding research transparency. *Trends Cogn. Sci.* **22**, 953–956 (2018).

37. Simonsohn, U., Simmons, J. P. & Nelson, L. D. Specification curve analysis. *Nat. Hum. Behav.* **4**, 1208–1214 (2020).
38. Aczel, B. et al. Consensus-based guidance for conducting and reporting multi-analyst studies. *eLife* **10**, e72185 (2021).
39. Sarafoglou, A. et al. Subjective evidence evaluation survey for multi-analysts studies. *R. Soc. Open Sci.* **11**, 240125 (2024).
40. DeI Giudice, M. & Gangestad, S. W. A traveler's guide to the multiverse: promises, pitfalls, and a framework for the evaluation of analytic decisions. *Adv. Methods Pract. Psychol. Sci.* **4**, 2515245920954925 (2021).
41. Liu, Y., Kale, A., Althoff, T. & Heer, J. Boba: authoring and visualizing multiverse analyses. *IEEE Trans. Visual Comput. Graphics* **27**, 1753–1763 (2020).
42. Olsson-Collentine, A., van Aert, R. C. M., Bakker, M. & Wicherts, J. Meta-analyzing the multiverse: a peek under the hood of selective reporting. *Psychol. Methods* **30**, 441–461 (2025).
43. Zwaan, R. A., Etz, A., Lucas, R. E. & Donnellan, M. B. Making replication mainstream. *Behav. Brain Sci.* **41**, e120 (2017).
44. Bartoś, F. et al. Introducing synchronous robustness reports. *Nat. Hum. Behav.* **9**, 635–637 (2025).

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rights holder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.

© The Author(s), under exclusive licence to Springer Nature Limited 2026

Balazs Aczel^{1,543,55}, Barnabas Szasz^{1,2,543,55}, Harry T. Clelland^{1,3}, Marton Kovacs^{1,4}, Felix Holzmeister⁵, Don van Ravenzwaaij⁶, Hannah Schulz-Kümpel⁷, Sabine Hoffmann⁷, Gustav Nilsson^{8,9}, Livia Kosa¹⁰, Zoltan A. Torma¹¹, Yousuf Abdelfatah¹⁰, Christopher L. Abersohn¹¹, Oguz A. Acar¹², Ensar Acem¹³, Matus Adamkovic^{14,15,16}, Timofey Adamovich¹⁷, Krisna Adiasto¹⁸, Love Ahnström⁸, Atakan M. Akil¹⁹, Adil S. Al-Busaidi^{20,21}, Ali H. Al-Hoorie²², Casper J. Albers⁶, Peter J. Allen²³, Taym Alsalti²⁴, Micah Altman²⁵, Shilaan Alzawah²⁶, Ettore Ambrosini²⁷, Saule Anafinova²⁸, Rahul Anand²⁹, Martin Angerer³⁰, Ariadna Angulo-Brunet³¹, Alberto Antonietti³², Josef Arato³³, Andreu Arenas³⁴, Marco M. Avina^{35,36}, Flavio Azevedo³⁷, Marko Bachl³⁸, Benec Bago³⁹, Štěpán Bahnik⁴⁰, Bradley J. Baker⁴¹, Elza Balayan⁴², Cassandra L. Baldwin⁴², Benjamin Banai⁴³, Kasia Banas⁴⁴, František Bartoš⁴⁵, Ernest Baskin⁴⁶, Jojanneke A. Bastiaansen⁴⁷, Nadège Bault⁴⁸, Christopher W. Bauman⁴⁹, Quintin H. Beazer⁵⁰, Maciej Behnke⁵¹, Theiss Bendixen⁵², Sebastian Berger⁵³, Anna Bernard⁵⁴, Ursula Bernardic⁵⁵, Paul A. Bloom⁵⁶, Annika Boldt⁵⁷, Ciril Bosch-Rosa⁵⁸, Rotem Botvinik-Nezer^{59,60}, Adam Bouyoumoun⁶¹, Ozge Bozkurt⁶², Laurel Brehm⁶³, Johannes Breuer^{64,65}, Ryan Briggs^{66,67}, Hilmar Brohm⁶⁸, Erin Buchanan⁶⁹, Johannes Buckenmaier⁷⁰, Jeffrey Buckley⁷¹, Jacek Buczyński^{72,73}, Matthias Burghart⁷⁴, Bilal H. Butt^{75,76}, Nick Byrd⁷⁷, Valentina Cafarella⁷⁸, Patrick Callahan⁷⁹, Tabaré Capitán⁸⁰, Kevin Carriere⁸¹, Andrea M. Cataldo^{82,83}, Gabriel Cepaluni^{84,85}, Eugene Chan⁸⁶, Jesse J. Chandler⁸⁷, Chia-chen Chang⁸⁸, Xi Chen^{89,90}, Shirley Shuo Chen⁹¹, Fadong Chen⁹², Hao Chen⁹³, Valerii Chirkov^{94,95}, Daniela Cialfi^{96,97}, Beth Clarke⁹⁸, Sophie G. Coelho⁹⁹, Clara Cohen¹⁰⁰, Susan Collins¹⁰¹, Susan W. Cook¹⁰², Gaia Corlazzoli¹⁰³, Jamie Cummins^{104,105}, Christian Czymara^{106,107}, Jonathan D'hondt^{108,109}, Anna Dalla Rosa¹¹⁰, Abi M. B. Davis¹¹¹, Charles P. Davis¹¹², Martin V. Day¹¹³, Freya De Keyzer¹¹⁴, Joshua R. de Leeuw¹¹⁵, Tjeerd Rudmer de Vries^{116,117}, Ramit Debnath^{118,119}, Filip Dechterenko¹²⁰, Elif E. Demiral¹²¹, Marc Desgroseilliers¹²², Dominik Dianovics¹⁴, Veronica Diveica¹²³, Stephan Dochow-Sondershausen¹²⁴, Simone Dohle¹²⁵, LiChen Dong¹²⁶, Jonas Doraz¹²⁷, Angela R. Dorough^{128,129}, Anna Drebe¹³⁰, Hongfei Du^{131,132}, John E. Edlund¹³³, Anita Eerland¹⁸, Emir Efendić¹³⁴, Jacob Elder¹³⁵, Mahmoud M. Elsheri^{136,137}, Mareike Erns¹³⁸, Eduardo Estrada¹³⁹, Luis Eudave¹⁴⁰, Thomas R. Evans^{141,142}, Arodi Ferrera¹⁴³, El Mehdi Ferrouhi¹⁴⁴, Lenka Fiala^{145,146,147}, Fabricio M. Fialho^{148,149}, Joshua L. Fiechter¹⁵⁰, Miloš Fišáček¹⁵¹, Pablo Ezequiel Flores-Kanter^{152,153}, Michał Folwarczynski¹⁵⁴, Jessica L. Fossum¹⁵⁵, Vithor R. Franco¹⁵⁶, René Freichel¹⁵⁷, Danilo Freire¹⁵⁸, Joris Frese¹⁵⁹, Alexander C. Furnas^{160,161}, Johann D. Gaebel¹⁶², Lisa C. Gajary^{163,164}, Carl Michael Galang^{165,166}, Benjamin Ganschow¹⁶⁷, S. Mason Garrison¹⁶⁸, Agata Gasiorowska¹⁶⁹, Bruno Gasparotto Ponne¹⁷⁰, Romain Gauriot¹⁷¹, Alice Gemiani^{172,540}, Diogo Geraldes^{173,174}, Morton Ann Gernsbacher¹⁷⁵, Cinzia Gianì¹⁷⁵, Enrico Gleerian¹⁷⁶, Vukašin Gligorić¹⁷⁷, Timo Gnams¹⁷⁸, Amélie Godefroidd^{179,180}, Bastián González-Bustamante^{181,182}, Andreas Goreis¹⁸³, Lorenz Graf-Vlachy^{184,185}, Manuel Grieder^{186,187}, Dmitry Grigoryev¹⁸⁸, Sandra Grinschgl^{189,190}, David J. Grüning¹⁹¹, João F. Guassi Moreira^{192,193}, Clément Guichet¹⁹⁴, Lilias Gurgand¹⁹⁵, Hooman Habibnia¹⁹⁶, Andrew C. Hafenbrack¹⁹⁷, Sebastian Hafenbrädl¹⁹⁸, Carolin Häffner¹⁹⁹, Felix Hagemeister²⁰⁰, Matthew Haigh²⁰¹, Nandor Hajdu²⁰², Narges Hajimoladavish²⁰², Jonathan D. Hall²⁰³, Maik Hamjedjies¹⁹⁹, Robert M. Hardwick²⁰⁴, Mehmet Harma^{13,205}, Nicholas R. Harp²⁰⁶, Áron D. Hartvig^{207,208}, Raphael H. Heiberger²⁰⁹, Arthur Heim^{210,211}, Øystein Hernæs²¹², Dennis Hernaus²¹³, Tom Heyman¹⁴, Joshua Hicks²¹⁵, Jeremy Hogeveen²¹⁶, Julia Höpfer⁷, Sean Dae Houlihan^{60,217}, Christoph Huber²¹⁸, Connor Hughes²¹⁹, Teresa Hummler⁶⁵, Karoline Huth²²⁰, Moritz Ingendahl²²¹, Tatsunori Ishii²²², Ozan Isler²²³, Kamil Izdyrczak¹⁶⁹, Iain R. Jackson²²⁴, Andrew Jahn^{225,226}, Maitri Jain²²⁷, Alexander Jakobov²²⁸, Daisung Jang²²⁹, JunHyok Jang³⁰, Marc Jekel¹²⁹, Fanli Jia²³¹, William Jiménez-Leal²³², Rebecca Johnson²³³, Alex Jones²³⁴, Sebastian Jungkunz^{235,236}, Pavol Kačmár²³⁷, Caspar Kaiser^{238,239}, Yağmur Kalaycı²⁴⁰, Jaroslav Kantorowicz²⁴¹, Anil Karabulut^{242,243}, Julian D. Karch²⁴⁴, Ghadir Karimi-Rouzbahani²⁴⁵, Johannes A. Kar^{246,247}, Austėja Kazemkaitytė²⁴⁸, Aliaksandr Kazlov²⁴⁹, Zoltan Kekecs¹, Jin Kim²⁵⁰, Michael H. Kirchner²⁵¹, Bence Kiss-Dobronyi²⁵², Kai N. Klammer^{253,254}, Jack W. Klein^{255,256}, Cemal Koba²⁵⁷, Marta Kotczyńska²⁵⁸, Pavlos Kolias²⁵⁹, Matěj Kolouch Grabovsky²⁶⁰, Max Korbmayer^{261,262,263}, Živa Korda⁶⁸, Marta Kowal²⁶⁴, André Kretzschmar²⁶⁵, Vladislav Krivoshchekov²⁶⁶, Angelos-Miltiades Kryptos^{267,268}, Marcus Kubisch²⁶⁹, Yoshihiko Kunisato²⁷⁰, David Lacko²⁷¹, Jan R. Landwehr²⁷², Martin Lange²⁷³, Hongmi Lee²⁷⁴, Daniel Lee²⁷⁵, Sangil Lee²⁷⁶, Edward P. Lemay Jr.²⁷⁷, Daniel Lempert²⁷⁸, Andrea Leo^{279,280}, Elise Lesage²⁸¹, Joel M. Levin^{282,283}, Peng Li²⁸⁴, Jing Li²⁸⁵, Luke Lindsay²⁸⁶, Daria Lisovic¹⁹⁹, Meng Liu²⁸⁷, Sihong Liu²⁸⁸, Tingshu Liu²⁸⁹, Sergio Lo Iacono²⁹⁰, Paul Lodder²⁹¹, Rubén López-Bueno²⁹², Ruben Lopez-Nicolas²⁹³, Katharina Loter²⁹¹, Nigel Mantou Lou²⁹⁴, Andrey Lovakov²⁹⁵, Jackson G. Lu²⁹⁶, Jonas Ludwig²⁹⁷, Finn Luebbe^{298,299}, Jiří Lukavský¹²⁰, Charles Q. Luo³⁰⁰, Xuanyu Lyu³⁰¹, Esther Maassen²⁹¹, Martin Mächel³⁰², Michael L. Mack³⁰³, Christopher R. Madan³⁰⁴, Andreas Mädebach³⁰⁵, Joseph Maffly-Kipp³⁰⁶, Daniel J. Mallinson³⁰⁷, Igor Marchetti³⁰⁸, Tyler Marghetis³⁰⁹, Matteo M. Marini³¹⁰, Diego Marino Fages³¹¹, Mayte Martínez^{312,313}, Mario Martinoli³¹⁴, Aidas Masilunas³¹⁵, Sébastien Massoni³¹⁶, Caleb C. Mathieu³¹⁷, Stefan Mayer³¹⁸, Duncan J. Mayer³¹⁹, Maren Mayer³²⁰, Ethan M. McCormick^{321,322}, Ian M. McDonough^{323,324}, Amanda L. McGowan^{325,326}, Miranda M. McIntyre³²⁷, Paul McKee^{112,326}, Armando N. Meier³²⁸, Pascal F. Meier³²⁹, Helena Melero³³⁰, Christoph Merkle^{331,332}, Raphael Merz²²¹, Michalis P. Michaelides³³³, Patrick Michaelson^{334,335}, Gosia Mikolajczak³³⁶, Wladislaw Mil³³⁷, Philip Millroth³³⁸, Kirill G. Miroshnik^{339,340}, Michal Misiak^{264,341}, Youri L. Mora³⁴², David Moreau^{343,344}, Chris Moreh^{345,346}, Coby Morvinski³⁴⁷, Faisal Mushtaq^{348,349}, Tamás Nagy¹, Christa Nater³⁵⁰, Elias Naumann³⁵¹, Gorka Navarrete³⁵², Stephan Nebe³⁵³, Andre Nedderhoff³⁵⁴, Richard Nestel³⁵⁵, Martin Neugebauer³⁵⁶, Eliana Nicolaisen-Sobczyk^{357,358}, Yngwie A. Nielsen³⁵⁹, Guiomar Niso³⁶⁰, Benjamin Nowak³⁶¹, Mehmet Okan³⁶², Kenneth Ong³⁰², Adrian I. Onicas³⁶³, Christian Oswald³⁶⁴, Kasper Otten³⁶⁵, Shubham Pandey^{366,367}, Myrto Pantazi^{342,368}, Paolo Papale³⁶⁹, Philip Pärnamets⁹, Shiva Pauer^{368,370}, Yuri G. Pavlov³⁷¹, Samuel Pawel³⁷², Jonathan E. Peelle³⁷³, Hannah K. Peetz¹⁸, Anton Peez^{374,375}, Francesca Pesciarelli^{376,377}, Brenton D. Peterson³⁷⁸, Benjamin Petruželka³⁷⁹, Jonas Petter¹⁵⁷, Jan Pfänder³⁸⁰, Gerit Pfuhl³⁸¹, Joseph Phillips³⁸², Matthew T. Pietryka³⁸³, Angelo Pirrone^{384,385}, Ilse L. Pit^{191,386,387}, Anna Plachti³⁸⁸, Irene Sophia Plank³⁸⁹, Matteo Ploner²⁴⁸, Russell A. Poldrack³⁹⁰, Monique M. H. Pollmann³⁹¹, Simon Porcher³⁹², Patrick Präg³⁹³, Andrew Adrian Y. Pua^{394,395}, Jessica Pugh³⁹⁶, Rohan Pur^{397,398}, Marcell Püski¹, Setayesh Radkani^{217,399}, Louis Raes¹⁴⁷, Ismaël Rafai^{400,401}, Klara Raiber⁴⁰², Steve Rathje⁴⁰³, Raphael Rehms^{79,541,542}, Mikhail Reshetnikov⁴⁰⁴, Caleb J. Reynolds⁴⁰⁵, James P. Reynolds⁴⁰⁶, Kévin Rigaud¹⁹³, Charlie Rioux⁴⁰⁷, Sebastian Rivera^{182,408}, Olly Robertson⁴⁰⁹

Rafael Román-Caballero^{410,411,412,413}, Ivan Popovic^{114,415}, Lukas Röseler^{416,417}, Robert M. Ross⁴¹⁸, Amanda Rotella²⁰¹, Franziska F. Rüffer²⁹¹, Felix Rusche^{337,419}, Massimo Rusconi⁴²⁰, Irene Russo⁴²¹, Alexander H. J. Sahn⁴²², Janos Salamon⁴²³, Margaret Samahita¹⁷³, Ali Sanaei⁴²⁴, Arshiya Sangchooli⁴²⁵, Alexandra Sarafoglou¹⁵⁷, Michele Scandola⁴²⁶, Henning Schaack⁴²⁷, Michael Schaefer⁴²⁸, Eric Schares⁴²⁹, Hayden T. Schilling⁴³⁰, Xenia Schmalz⁴³¹, Kathleen Schmidt⁴³², Tom Schonberg⁴³³, Marcel R. Schreiner^{434,435}, Joris M. Schröder⁴³⁶, Anna-Lena Schubert⁴³⁷, Brendan Schuetze⁴³⁸, Douglas H. Schultz⁴³⁹, Lars Schulze⁴⁴⁰, Shawn T. Schwartz^{390,441}, Nicole Schwitter^{442,443}, Bermond Scoggins⁴⁴⁴, Yashvin Seethal⁴⁴⁵, Raffaello Seri⁴²⁰, David R. Shanks⁴⁴⁶, Stacy T. Shaw⁴⁴⁷, Joseph Shaw⁴⁴⁸, Qiang Shen⁴⁴⁹, Christoph Siemroth⁴⁵⁰, Martina Sladekova⁴⁵¹, Angela Somo⁴⁵², Arjun Sondhi⁴⁵³, Burak Sonmez⁴⁵⁴, Lisa Spantig^{450,455}, Maerten Speekenbrink⁴⁵⁶, Angelos Stamos⁴⁵⁷, Lukasz Stasielowski⁴⁵⁸, Leonie C. Steckermeier^{459,460}, Simon R. Steinkamp³⁸⁸, Andrea H. Stoevenbelt⁴⁶¹, Chris N. H. Street⁴⁶², Jordan W. Suchow⁴⁶³, Hans Fredrik Sunde⁴⁶⁴, James Sundquist^{465,466}, Vesevod Suschewskiy^{467,468}, Scott D. Swain⁴⁶⁹, Peter Szecs^{1,4}, Raluca D. Szekely-Copinand^{470,471}, Ewa Szumowska⁴⁷², Alessandro Taccanelli⁴⁷³, Eli Talbert⁴⁷⁴, John P. Tang⁴⁷⁵, Jorge N. Tendeiro⁴⁷⁶, Martina Testori⁴⁷⁷, Enrico Toffalini⁴⁷⁸, Aleksandar Tomašević⁴⁷⁹, Selin Topel^{244,480,481}, Lasse Torkkelä^{482,483,484}, Leonardo Tozzi⁴⁸⁵, Jakub Traczyk¹⁶⁹, Alexander Trinidad⁴⁸⁶, Darinka Trübschek^{487,488}, Konrad Turek⁴⁸⁹, Maximiliane Uhlisch⁴⁹⁰, Eric L. Uhlmann⁴⁹¹, Karolina Urbanska⁴⁹², Jasper Van Assche^{342,493}, Marcel A. L. M. van Assen⁴⁹⁴, Noah N. N. van Dongen¹⁵⁷, Kenny van Lieshout⁴⁹⁵, Roel van Veldhuizen⁴⁹⁶, Marton A. Varga¹, Leigh Ann Vaughn⁴⁹⁷, Fruzsina Venczel¹, Michela Vezzoli⁴⁹⁸, Paul Vierus⁶⁵, Antonino Visalli⁴⁹⁹, Emily Voldat⁵⁰⁰, Fabio Votta⁵⁰¹, Eric-Jan Wagenmakers¹⁵⁷, Anica Waldendorf⁵⁰², Matthew J. Walker⁵⁰³, Matthew B. Wall^{504,505}, Henri Wallen⁵⁰⁶, Ke Wang⁵⁰⁷, Iris Wang⁵⁰⁸, Y. Andre Wang³⁰³, Markus Weinmann⁵⁰⁹, Martin Weiß⁵¹⁰, Christian Westheide^{511,512}, Aaron Wichman^{513,514}, Juliane C. Wilcke⁷⁹, Benedict J. Williams⁵¹⁵, David Wisniewski^{116,516,517}, Thomas K. A. Woiczyl⁵¹⁸, Mateusz Wozniak^{519,520,521}, Joshua D. Wright⁵²², Wu Youyou⁵²³, Jesper N. Wulff³³¹, Tao Yang⁵²⁴, Siu Kit Yeung⁵²⁵, Kenneth S. L. Yuen^{526,527}, Michał Zawistowski¹⁵², Rizqay A. Zein^{528,530}, Xian Zhao⁵³¹, Zefan Zheng^{532,533}, Steven Zhou⁵³⁴, Conrad Zille⁴⁹⁹, David Zimmermann⁵³⁵, Cristina Zogmaister⁵³⁶, Ro'i Zultan⁵³⁷, Nicholas Fox⁵³⁸, Timothy M. Errington⁵³⁸ & Brian A. Nosek^{538,539}

¹Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary. ²Institute of Operations and Decision Sciences, Corvinus Institute for Advanced Studies (CIAS), Corvinus University of Budapest, Budapest, Hungary. ³Department of Psychology, Edge Hill University, Ormskirk, UK. ⁴Doctoral School of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary. ⁵Department of Economics, University of Innsbruck, Innsbruck, Austria. ⁶Department of Psychometrics and Statistics, University of Groningen, Groningen, The Netherlands. ⁷Department of Statistics, Ludwig Maximilian University Munich, Munich, Germany. ⁸Department of Clinical Neuroscience, Karolinska Institutet, Stockholm, Sweden. ⁹Department of Psychology, Stockholm University, Stockholm, Sweden. ¹⁰Department of Politics, Princeton University, Princeton, NJ, USA. ¹¹The Dissertation Coach, Oak Park, CA, USA. ¹²King's Business School, King's College London, London, UK. ¹³Department of Psychology, Kadir Has University, Istanbul, Turkey. ¹⁴Centre of Social and Psychological Sciences, Slovak Academy of Sciences, Bratislava, Slovakia. ¹⁵Faculty of Humanities and Social Sciences, University of Jyväskylä, Jyväskylä, Finland. ¹⁶Faculty of Education, Charles University, Prague, Czechia. ¹⁷Behavioral Genetics Laboratory, Psychological Institute of the Russian Academy of Education, Moscow, Russia. ¹⁸Behavioural Science Institute, Radboud University, Nijmegen, The Netherlands. ¹⁹Institute of Psychology, Faculty of Humanities and Social Sciences, University of Pécs, Pécs, Hungary. ²⁰Innovation and Technology Transfer Center, Sultan Qaboos University, Muscat, Oman. ²¹Business Communication Department, Sultan Qaboos University, Muscat, Oman. ²²Jubail English Language and Preparatory Year Institute, Royal Commission for Jubail and Yanbu, Jubail Industrial City, Saudi Arabia. ²³School of Psychological Science, University of Bristol, Bristol, UK. ²⁴Personality Psychology and Psychological Diagnostics, University of Leipzig, Leipzig, Germany. ²⁵Center for Research on Equitable and Open Scholarship, Massachusetts Institute of Technology, Cambridge, MA, USA. ²⁶Graduate School of Business, Stanford University, Stanford, CA, USA. ²⁷Department of Neuroscience, University of Padova, Padova, Italy. ²⁸Department of Technical Education, Faculty of Economic and Social Sciences, Budapest University of Technology and Economics, Budapest, Hungary. ²⁹Department of Management, Aarhus BSS (Aarhus University), Aarhus, Denmark. ³⁰Liechtenstein Business School, University of Liechtenstein, Vaduz, Liechtenstein. ³¹Faculty of Psychology and Educational Sciences, Universitat Oberta de Catalunya, Barcelona, Spain. ³²Department of Electronics, Information and Bioengineering, Politecnico di Milano, Milan, Italy. ³³Vienna Cognitive Science Hub, University of Vienna, Vienna, Austria. ³⁴Institut d'Economia de Barcelona and IPERC, University of Barcelona, Barcelona, Spain. ³⁵Department of Government, Harvard University, Cambridge, MA, USA. ³⁶James M. and Cathleen D. Stone PhD Scholars in Inequality and Wealth Concentration, Cambridge, MA, USA. ³⁷Department of Interdisciplinary Social Science, University of Utrecht, Utrecht, The Netherlands. ³⁸Institute for Media and Communication Studies, Freie Universität Berlin, Berlin, Germany. ³⁹Department of Social Psychology, Tilburg University, Tilburg, The Netherlands. ⁴⁰Department of Management, Faculty of Business Administration, Prague University of Economics and Business, Prague, Czech Republic. ⁴¹Department of Sport, Tourism and Hospitality Management, Temple University, Philadelphia, PA, USA. ⁴²Department of Psychology, Georgia Southern University, Statesboro, GA, USA. ⁴³Banai Analitika, Osijek, Croatia. ⁴⁴Usher Institute, University of Edinburgh, Edinburgh, UK. ⁴⁵Department of Psychological Methods, University of Amsterdam, Amsterdam, The Netherlands. ⁴⁶Department of Food, Pharma and Healthcare, Saint Joseph's University, Philadelphia, PA, USA. ⁴⁷Department of Psychiatry, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands. ⁴⁸Brain Research & Imaging Centre, School of Psychology, University of Plymouth, Plymouth, UK. ⁴⁹Paul Merage School of Business, University of California, Irvine, Irvine, CA, USA. ⁵⁰Department of Political

Article

Science, Florida State University, Tallahassee, FL, USA.⁵¹Cognitive Neuroscience Center, Adam Mickiewicz University, Poznan, Poland.⁵²School of Culture and Society, Aarhus University, Aarhus, Denmark.⁵³Bern University of Applied Science, Bern, Switzerland.⁵⁴Universidade Católica Portuguesa, Católica Lisbon School of Business & Economics, Lisbon, Portugal.⁵⁵CEPE, ETH Zürich, Zurich, Switzerland.⁵⁶Psychiatry Department, Columbia University, New York, NY, USA.⁵⁷Institute of Cognitive Neuroscience, University College London, London, UK.⁵⁸Chair of Macroeconomics, Technical University of Berlin, Berlin, Germany.⁵⁹Department of Psychology, Hebrew University of Jerusalem, Jerusalem, Israel.⁶⁰Psychological and Brain Sciences, Dartmouth College, Hanover, NH, USA.⁶¹Department of Politics, Princeton University, Princeton, NJ, USA.⁶²Department of Psychology, Anadolu University, Eskişehir, Turkey.⁶³Department of Linguistics, University of California, Santa Barbara, Santa Barbara, CA, USA.⁶⁴Research Data & Methods, Center for Advanced Internet Studies (CAIS), Bochum, Germany.⁶⁵Department of Political Science, University of Duisburg-Essen, Duisburg, Germany.⁶⁶Guelph Institute of Development Studies, University of Guelph, Guelph, ON, Canada.⁶⁷Department of Political Science, University of Guelph, Guelph, ON, Canada.⁶⁸Department of Psychology, University of Graz, Graz, Austria.⁶⁹Analytics, Harrisburg University of Science and Technology, Harrisburg, PA, USA.⁷⁰Department of Economics, University of Zurich, Zurich, Switzerland.⁷¹Department of Technology Education, Technological University of the Shannon: Midlands Midwest, Athlone, Ireland.⁷²Experimental and Applied Psychology, Vrije Universiteit Amsterdam, Amsterdam, The Netherlands.⁷³Institute of Psychology, SWPS University, Sopot, Poland.⁷⁴Department of Criminology, Max Planck Institute for the Study of Crime, Security and Law, Freiburg, Germany.⁷⁵School of Mathematics and Computer Science (SMCS), Institute of Business Administration, Karachi, Pakistan.⁷⁶Computer Science Department, DHA Suffa University, Karachi, Pakistan.⁷⁷School of Humanities, Arts, and Social Sciences, Stevens Institute of Technology, Hoboken, NJ, USA.⁷⁸Independent Researcher, New York, NY, USA.⁷⁹Institute for Medical Information Processing, Biometry, and Epidemiology, Faculty of Medicine, Ludwig-Maximilians-Universität München, Munich, Germany.⁸⁰Department of Economics, Swedish University of Agricultural Sciences, Uppsala, Sweden.⁸¹Department of Psychology, Stonehill College, Easton, MA, USA.⁸²Center for Depression, Anxiety, and Stress Research, McLean Hospital, Belmont, MA, USA.⁸³Department of Psychiatry, Harvard Medical School, Boston, MA, USA.⁸⁴Department of International Relations and Public Policy, São Paulo State University, Franca, Brazil.⁸⁵Kellogg Institute for International Studies, University of Notre Dame, Notre Dame, IN, USA.⁸⁶Ted Rogers School of Management, Toronto Metropolitan University, Toronto, Ontario, Canada.⁸⁷Institute for Social Research, University of Michigan, Ann Arbor, MI, USA.⁸⁸Department of Biological Sciences, National University of Singapore, Singapore, Singapore.⁸⁹Chinese Open Science Network, Shanghai, China.⁹⁰Department of Intelligent Perception and Interaction Research, OPPO Shanghai Research Institute, Shanghai, China.⁹¹Lazaridis School of Business and Economics, Wilfrid Laurier University, Waterloo, Ontario, Canada.⁹²School of Management, Neuromanagement Laboratory and The State Key Laboratory of Brain-Machine Intelligence, Zhejiang University, Hangzhou, China.⁹³Department of Psychiatry and Psychotherapy, Technische Universität Dresden, Dresden, Germany.⁹⁴Institute for Theoretical Biology, Department of Biology, Humboldt-Universität zu Berlin, Berlin, Germany.⁹⁵Science of Intelligence Research Cluster of Excellence, Berlin, Germany.⁹⁶Institute for Complex Systems, National Research Council of Italy, Rome, Italy.⁹⁷Enrico Fermi Research Center, Rome, Italy.⁹⁸Melbourne School of Psychological Sciences, University of Melbourne, Melbourne, Victoria, Australia.⁹⁹Department of Psychology, York University, Toronto, Ontario, Canada.¹⁰⁰English Language and Linguistics, School of Critical Studies, University of Glasgow, Glasgow, UK.¹⁰¹UTS Business School, University of Technology Sydney, Ultimo, New South Wales, Australia.¹⁰²Department of Psychological and Brain Sciences, University of Iowa, Iowa City, IA, USA.¹⁰³Center for Research in Cognition & Neurosciences, Université Libre de Bruxelles, Brussels, Belgium.¹⁰⁴Department of Psychology of Digitalisation, University of Bern, Bern, Switzerland.¹⁰⁵Department of Experimental Clinical and Health Psychology, Ghent University, Ghent, Belgium.¹⁰⁶Department of Sociology and Anthropology, Tel Aviv University, Tel Aviv, Israel.¹⁰⁷Department of Sociology, Goethe University Frankfurt, Frankfurt, Germany.¹⁰⁸Department of Work, Organisation and Society, Ghent University, Ghent, Belgium.¹⁰⁹Department of Marketing, Vrije Universiteit Amsterdam, Amsterdam, The Netherlands.¹¹⁰Department of Philosophy, Sociology, Education and Applied Psychology, University of Padua, Padua, Italy.¹¹¹School of Psychology, University of Lincoln, Lincoln, UK.¹¹²Department of Psychology & Neuroscience, Duke University, Durham, NC, USA.¹¹³Department of Psychology, Memorial University of Newfoundland, St. John's, Newfoundland, Canada.¹¹⁴Erasmus School of History, Culture and Communication, Erasmus University Rotterdam, Rotterdam, The Netherlands.¹¹⁵Cognitive Science, Vassar College, Poughkeepsie, NY, USA.¹¹⁶Copenhagen Health Complexity Center, Department of Public Health, University of Copenhagen, Copenhagen, Denmark.¹¹⁷Department of Health Sciences, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands.¹¹⁸Collective Intelligence and Design Group, University of Cambridge, Cambridge, UK.¹¹⁹Climate and Social Intelligence Laboratory, California Institute of Technology, Pasadena, CA, USA.¹²⁰Department of Cognitive Psychology, Institute of Psychology, Czech Academy of Sciences, Prague, Czech Republic.¹²¹College of Business and Technology, East Tennessee State University, Johnson City, TN, USA.¹²²School of Computer Communication Sciences, Ecole Polytechnique Lausanne, Lausanne, Switzerland.¹²³Montreal Neurological Institute, Department of Neurology and Neurosurgery, McGill University, Montreal, Quebec, Canada.¹²⁴Department of Sociology, University of Copenhagen, Copenhagen, Denmark.¹²⁵Institute of General Practice and Family Medicine, University Hospital Bonn, University of Bonn, Bonn, Germany.¹²⁶Department of Psychology, University of Wisconsin–Madison, Madison, WI, USA.¹²⁷Department of Psychology, University of Washington, Seattle, WA, USA.¹²⁸Faculty of Psychology, FernUniversität in Hagen, Hagen, Germany.¹²⁹Department of Psychology, University of Cologne, Cologne, Germany.¹³⁰Department of Economics, Stockholm School of Economics, Stockholm, Sweden.¹³¹Department of Psychology, Beijing Normal University at Zhuhai, Zhuhai, China.¹³²Beijing Key Laboratory of Applied Experimental Psychology, National Demonstration Center for Experimental Psychology Education (Beijing Normal University), Faculty of Psychology, Beijing Normal University, Beijing, China.¹³³Department of Psychology, Rochester Institute of Technology, Rochester, NY, USA.¹³⁴Department of Marketing and Supply-Chain Management, School of Business and Economics, Maastricht University, Maastricht, The Netherlands.¹³⁵Independent Researcher, Philadelphia, PA, USA.¹³⁶Psychology and Vision Sciences, University of Leicester, Leicester, UK.¹³⁷University of Birmingham, Birmingham, UK.¹³⁸Department of Clinical Psychology, Psychotherapy and Psychoanalysis, Institute of Psychology, University of Klagenfurt, Klagenfurt am Woerthersee, Austria.¹³⁹Social Psychology and Methodology, Universidad Autónoma de Madrid, Madrid, Spain.¹⁴⁰School of Education and Psychology, University of Navarra, Pamplona, Spain.¹⁴¹School of Human Sciences, University of Greenwich, London, UK.¹⁴²Institute for Lifecourse Development, University of Greenwich, London, UK.¹⁴³Institute of Anthropological Research, National Autonomous University of Mexico, Mexico City, Mexico.¹⁴⁴Faculty of Economics and Management, University Ibn Tofail, Kénitra, Morocco.¹⁴⁵Department of Economics, University of Ottawa, Ottawa, Ontario, Canada.¹⁴⁶Institute for Replication, University of Ottawa, Ottawa, Ontario, Canada.¹⁴⁷Department of Economics, Tilburg University, Tilburg, The Netherlands.¹⁴⁸School of Sociology, HSE University, Moscow, Russia.¹⁴⁹International Inequalities Institute, London School of Economics and Political Science, London, UK.¹⁵⁰Department of Psychology, Wright State University, Dayton, OH, USA.¹⁵¹Department of Public Economics & MUEEL, Masaryk University, Brno, Czech Republic.¹⁵²Universidad Siglo 21, Córdoba, Argentina.¹⁵³Universidad Católica de Córdoba, Córdoba, Argentina.¹⁵⁴Discipline of Marketing, J.E. Cairnes School of Business & Economics, University of Galway, Galway, Ireland.¹⁵⁵Department of Psychology, Seattle Pacific University, Seattle, WA, USA.¹⁵⁶Postgraduate Program of Psychology, São Francisco University, Campinas, Brazil.¹⁵⁷Department of Psychology, University of Amsterdam, Amsterdam, The Netherlands.¹⁵⁸Department of Data and Decision Sciences, Emory University, Atlanta, GA, USA.¹⁵⁹Department of Political and Social Sciences, European University Institute, Fiesole, Italy.¹⁶⁰Center for Science of Science & Innovation, Evanston, IL, USA.¹⁶¹Kellogg School of Management, Northwestern University, Evanston, IL, USA.¹⁶²Department of Statistics, Harvard University, Cambridge, MA, USA.¹⁶³John Glenn College of Public Affairs, Ohio State University, Columbus, OH, USA.¹⁶⁴River Forest, LLC, Dublin, OH, USA.¹⁶⁵Psychology, Humboldt-Universität zu Berlin, Berlin, Germany.¹⁶⁶Berlin School of Mind and Brain, Berlin, Germany.¹⁶⁷Education and Child Studies, Leiden University, Leiden, The Netherlands.¹⁶⁸Department of Psychology, Wake Forest University, Winston-Salem, NC, USA.¹⁶⁹Faculty of Psychology in Wrocław, SWPS University, Wrocław, Poland.¹⁷⁰Federal Senate of Brazil, Brasília, Brazil.¹⁷¹Department of Economics, Deakin University, Melbourne, Victoria, Australia.¹⁷²Department of Brain and Behavioral Sciences, University of Pavia, Pavia, Italy.¹⁷³School of Economics, University College Dublin, Dublin, Ireland.¹⁷⁴Geary Institute for Public Policy, University College Dublin, Dublin, Ireland.¹⁷⁵Independent Researcher, Como, Italy.¹⁷⁶Department of Neuroscience and Biomedical Engineering, Aalto University, Espoo, Finland.¹⁷⁷Department of Psychology, New York University Abu Dhabi, Abu Dhabi, United Arab Emirates.¹⁷⁸Educational Measurement, Leibniz Institute for Educational Trajectories, Bamberg, Germany.¹⁷⁹Centre for Research on Peace and Development, KU Leuven, Leuven, Belgium.¹⁸⁰IESEG School of Management, Lille, France.¹⁸¹Institute of Public Administration, Leiden University, The Hague, The Netherlands.¹⁸²Universidad Diego Portales, Santiago, Chile.¹⁸³Department of Child and Adolescent Psychiatry, Medical University of Vienna, Vienna, Austria.¹⁸⁴Department of Business and Economics, TU Dortmund University, Dortmund, Germany.¹⁸⁵ESCP Business School, Paris, France.¹⁸⁶Faculty of Business and Economics, UniDistance Suisse, Brig, Switzerland.¹⁸⁷School of Management and Law, Zurich University of Applied Sciences (ZHAW), Winterthur, Switzerland.¹⁸⁸Center for Sociocultural Research, HSE University, Moscow, Russia.¹⁸⁹Institute of Psychology, University of Bern, Bern, Switzerland.¹⁹⁰Institute of Psychology, University of Graz, Graz, Austria.¹⁹¹Center for Adaptive Rationality, Max Planck Institute for Human Development, Berlin, Germany.¹⁹²Department of Psychology, University of California, Los Angeles, Los Angeles, CA, USA.¹⁹³Department of Psychology, University of Wisconsin-Madison, Madison, USA.¹⁹⁴Department of Psychology, University Grenoble Alpes, CNRS UMR 5105 LPNC, Grenoble, France.¹⁹⁵Département d'études cognitives, Ecole Normale Supérieure Paris, Paris, France.¹⁹⁶Department of Strategy of Innovation, Institute for Cognition and Behavior, WU Vienna University of Economics and Business, Vienna, Austria.¹⁹⁷Management & Organization, University of Washington, Seattle, WA, USA.¹⁹⁸Managing People in Organizations, IESE Business School, Barcelona, Spain.¹⁹⁹Department of Psychology: Social Psychology, University of Cologne, Cologne, Germany.²⁰⁰Data Science, Sueddeutsche Zeitung Digitale Medien, Munich, Germany.²⁰¹Department of Psychology, Northumbria University, Newcastle upon Tyne, UK.²⁰²Tehran Institute for Advanced Studies, Khatam University, Tehran, Iran.²⁰³Department of Economics, Finance, and Legal Studies, University of Alabama, Tuscaloosa, AL, USA.²⁰⁴Institute of Neuroscience, Catholic University of Louvain, Brussels, Belgium.²⁰⁵Faculty of Psychology, University of Akureyri, Akureyri, Iceland.²⁰⁶Department of Psychology, University of California, Berkeley, Berkeley, CA, USA.²⁰⁷Department of Decision Sciences, Corvinus University of Budapest, Budapest, Hungary.²⁰⁸International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria.²⁰⁹Institute for Social Sciences, University of Stuttgart, Stuttgart, Germany.²¹⁰Labour and Public Policies, Paris School of Economics, Paris, France.²¹¹Statistics, Evaluation and Research Department, Caisse Nationale des Allocations Familiales, Paris, France.²¹²Ragnar Frisch Centre for Economic Research, Oslo, Norway.²¹³Department of Psychiatry & Neuropsychology, Mental Health and Neuroscience (MHeNS) Research Institute, Maastricht University, Maastricht, The Netherlands.²¹⁴Methodology and Statistics Unit, Institute of Psychology, Leiden University, Leiden, The Netherlands.²¹⁵Psychological and Brain Sciences, Texas A&M University, College

Station, TX, USA. ²¹⁸Department of Psychology, University of New Mexico, Albuquerque, NM, USA. ²¹⁷Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology, Cambridge, MA, USA. ²¹⁸Department of Finance, Aalto University, Espoo, Finland. ²¹⁹Applied Economics, University of Minnesota, St. Paul, MN, USA. ²²⁰Department of Health Promotion, Care and Public Health Research Institute (CAPHRI), Maastricht University, Maastricht, The Netherlands. ²²¹Human Technology Interaction Group, Eindhoven University of Technology, Eindhoven, The Netherlands. ²²²Department of Psychology, Japan Women's University, Bunkyo-ku, Japan. ²²³School of Economics, The University of Queensland, St Lucia, QLD 4072, Australia. ²²⁴Manchester Centre for Audiology and Deafness, University of Manchester, Manchester, UK. ²²⁵Department of Radiology, University of Michigan, Ann Arbor, MI, USA. ²²⁶fMRI Laboratory, Ann Arbor, MI, USA. ²²⁷Department of Psychology, Eastern Michigan University, Ypsilanti, MI, USA. ²²⁸Yale Law School, Yale University, New Haven, CT, USA. ²²⁹Melbourne Business School, Melbourne, Victoria, Australia. ²³⁰Political Science, University of California, Merced, Merced, CA, USA. ²³¹Department of Psychology, Seton Hall University, South Orange, NJ, USA. ²³²Department of Psychology, Universidad de los Andes, Bogotá, Colombia. ²³³McCourt School of Public Policy, Georgetown University, Washington, DC, USA. ²³⁴School of Psychology, Swansea University, Swansea, UK. ²³⁵Institute of Sociology, Martin Luther University Halle-Wittenberg, Halle, Germany. ²³⁶Institute of Political Science, University of Bamberg, Bamberg, Germany. ²³⁷Department of Psychology, Faculty of Arts, Pavol Jozef Šafárik University in Košice, Košice, Slovakia. ²³⁸Warwick Business School, University of Warwick, Coventry, UK. ²³⁹University of Oxford, Oxford, UK. ²⁴⁰Independent Researcher, Manisa, Turkey. ²⁴¹Institute of Security and Global Affairs, Leiden University, The Hague, The Netherlands. ²⁴²MoMiLab, Social and Affective Neuroscience Group, IMT School for Advanced Studies Lucca, Lucca, Italy. ²⁴³Department of Psychology, University of Essex, Colchester, UK. ²⁴⁴Institute of Psychology, Leiden University, Leiden, The Netherlands. ²⁴⁵Queensland Brain Institute, University of Queensland, Brisbane, Queensland, Australia. ²⁴⁶School of Psychology, Dublin City University, Dublin, Ireland. ²⁴⁷Victoria University of Wellington, Wellington, New Zealand. ²⁴⁸Department of Economics and Management, University of Trento, Trento, Italy. ²⁴⁹Flo Health LTU, Vilnius, Lithuania. ²⁵⁰CUHK Business School, Chinese University of Hong Kong, Hong Kong, China. ²⁵¹Department of Banking and Finance, University of Innsbruck, Innsbruck, Austria. ²⁵²Institute of Operations and Decision Sciences, Corvinus University of Budapest, Budapest, Hungary. ²⁵³Structural Change and Work Organisation, Federal Institute for Occupational Safety and Health (BAuA), Dortmund, Germany. ²⁵⁴Chair for Industrial/Organizational Psychology, University of Hamburg, Hamburg, Germany. ²⁵⁵Department of Psychology, University of Hong Kong, Hong Kong SAR, China. ²⁵⁶Hong Kong Institute of Asia-Pacific Studies, Chinese University of Hong Kong, Hong Kong SAR, China. ²⁵⁷Computational Neuroscience Group, Sano Centre for Computational Personalized Medicine, Krakow, Poland. ²⁵⁸Department of Research on Social and Institutional Transformations, Institute of Political Studies of the Polish Academy of Sciences, Warsaw, Poland. ²⁵⁹Department of Mathematics, Aristotle University of Thessaloniki, Thessaloniki, Greece. ²⁶⁰Independent Researcher, Brno, Czechia. ²⁶¹Department of Health and Functioning, Western Norway University of Applied Sciences, Bergen, Norway. ²⁶²Mohn Medical Imaging and Visualisation Center, Bergen, Norway. ²⁶³Neuro-SysMed, Department of Clinical Medicine, University of Bergen, Bergen, Norway. ²⁶⁴IDN Being Human Lab, Institute of Psychology, University of Wrocław, Wrocław, Poland. ²⁶⁵Department of Psychology, University of Zurich, Zurich, Switzerland. ²⁶⁶CAPE, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland. ²⁶⁷Department of Clinical Psychology, Utrecht University, Utrecht, The Netherlands. ²⁶⁸Group of Health Psychology, KU Leuven, Leuven, Belgium. ²⁶⁹Department of Physics, Freie Universität Berlin, Berlin, Germany. ²⁷⁰Department of Psychology, Senshu University, Kawasaki, Japan. ²⁷¹Department of Personality Psychology and Social Psychology, Institute of Psychology, Czech Academy of Sciences, Brno, Czech Republic. ²⁷²Department of Marketing, Goethe University Frankfurt, Frankfurt, Germany. ²⁷³Labour Markets and Social Insurance, ZEW – Leibniz Centre for European Economic Research, Mannheim, Germany. ²⁷⁴Department of Psychological Sciences, Purdue University, West Lafayette, IN, USA. ²⁷⁵Lerner College of Business, University of Delaware, Newark, DE, USA. ²⁷⁶Department of Psychological and Brain Sciences, Boston University, Boston, MA, USA. ²⁷⁷Psychology, University of Maryland, College Park, MD, USA. ²⁷⁸Department of Politics, State University of New York Potsdam, Potsdam, NY, USA. ²⁷⁹Department of Translational Research and Advanced Technologies in Medicine and Surgery, University of Pisa, Pisa, Italy. ²⁸⁰Nuclear Medicine Unit, Department of Diagnostic Imaging, N.O.P. – S. Stefano, U.S.L. Toscana Centro, Prato, Italy. ²⁸¹Department of Experimental Psychology, University of Ghent, Ghent, Belgium. ²⁸²Rady School of Management, University of California San Diego, La Jolla, CA, USA. ²⁸³Katz Graduate School of Business, University of Pittsburgh, Pittsburgh, PA, USA. ²⁸⁴School of Management, University of Bath, Bath, UK. ²⁸⁵Stanford Graduate School of Business, Stanford, CA, USA. ²⁸⁶Department of Economics, University of Exeter, Exeter, UK. ²⁸⁷School of English and International Studies, Beijing Foreign Studies University, Beijing, China. ²⁸⁸Stanford Center on Early Childhood, Stanford University, Stanford, CA, USA. ²⁸⁹Department of Social, Personality, and Health Psychology, University of Houston, Houston, TX, USA. ²⁹⁰Department of Sociology and Criminology, University of Essex, Colchester, UK. ²⁹¹Department of Methodology and Statistics, Tilburg University, Tilburg, The Netherlands. ²⁹²Department of Health Sciences, Public University of Navarra, Pamplona, Spain. ²⁹³Department of Basic Psychology and Methodology, University of Murcia, Murcia, Spain. ²⁹⁴Department of Psychology, University of Victoria, Victoria, British Columbia, Canada. ²⁹⁵German Centre for Higher Education Research and Science Studies (DZHW), Berlin, Germany. ²⁹⁶MIT Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA, USA. ²⁹⁷Technische Universität Berlin, Berlin, Germany. ²⁹⁸Social Neuroscience Lab, Department of Psychiatry and Psychotherapy, University of Lübeck, Lübeck, Germany. ²⁹⁹Open Science Initiative, University of Lübeck, Lübeck, Germany. ³⁰⁰Department of Economics, University of Maryland, College Park, MD, USA. ³⁰¹Institute for Behavioral Genetics, University of Colorado Boulder, Boulder, CO, USA. ³⁰²Department of Psychology, Faculty of Arts, Charles University, Prague, Czech Republic. ³⁰³Department of Psychology, University of Toronto, Toronto, Ontario, Canada. ³⁰⁴School of Psychology, University of Nottingham, Nottingham, UK. ³⁰⁵Department of Translation and Language Sciences, Universitat Pompeu Fabra, Barcelona, Spain. ³⁰⁶Department of Psychiatry, College of Medicine, The Ohio State University Wexner Medical Center, Columbus, OH, USA. ³⁰⁷School of Public Affairs, Penn State Harrisburg, Middletown, PA, USA. ³⁰⁸Department of Health Sciences, University of Florence, Florence, Italy. ³⁰⁹Cognitive and Information Sciences, University of California, Merced, Merced, CA, USA. ³¹⁰Department of Economics, University of Bologna, Bologna, Italy. ³¹¹Department of Economics, Durham University, Durham, UK. ³¹²Department of Interdisciplinary Life Sciences, Domestication Lab, Konrad Lorenz Institute of Ethology, University of Veterinary Medicine Vienna, Vienna, Austria. ³¹³Language Research Center, Georgia State University, Atlanta, GA, USA. ³¹⁴Institute of Economics & L'EmbeDS, Sant'Anna School of Advanced Studies, Pisa, Italy. ³¹⁵School of Economics, University of Sheffield, Sheffield, UK. ³¹⁶Université de Lorraine-Université de Strasbourg, CNRS, BETA, Nancy, France. ³¹⁷Department of Psychology and Special Education, East Texas A&M University, Commerce, TX, USA. ³¹⁸School of Business and Economics, University of Tübingen, Tübingen, Germany. ³¹⁹Independent Researcher, Doylestown, PA, USA. ³²⁰Leibniz-Institut für Wissensmedien (Knowledge Media Research Center), Tübingen, Germany. ³²¹Methodology & Statistics, Universiteit Leiden, Leiden, The Netherlands. ³²²Education Statistics and Research Methods, University of Delaware, Newark, DE, USA. ³²³Department of Psychology, Binghamton University, Binghamton, NY, USA. ³²⁴Center for Cognitive Applications, Binghamton University, Binghamton, NY, USA. ³²⁵Annenberg School for Communication, University of Pennsylvania, Philadelphia, PA, USA. ³²⁶Department of Psychology, Southern Connecticut State University, New Haven, CT, USA. ³²⁷Department of Psychology, California State University, San Bernardino, San Bernardino, CA, USA. ³²⁸Faculty of Business and Economics, University of Basel, Basel, Switzerland. ³²⁹Department of Business Administration, University of Zurich, Zurich, Switzerland. ³³⁰Departamento de Psicobiología y Metodología en Ciencias del Comportamiento, Universidad Complutense de Madrid, Madrid, Spain. ³³¹Department of Economics and Business Economics, Aarhus University, Aarhus, Denmark. ³³²Danish Finance Institute, Frederiksberg, Denmark. ³³³Department of Psychology, University of Cyprus, Nicosia, Cyprus. ³³⁴Department of Political Science, University of Gothenburg, Gothenburg, Sweden. ³³⁵Department of Management and Engineering, Division of Economics, JEDI Lab, Linköping University, Linköping, Sweden. ³³⁶Global Institute for Women's Leadership, Australian National University, Canberra, Australia. ³³⁷Department of Economics, University of Mannheim, Mannheim, Germany. ³³⁸Department of Psychology, Uppsala University, Uppsala, Sweden. ³³⁹Department of Life Sciences, University of Trieste, Trieste, Italy. ³⁴⁰Faculty of Psychology, Saint Petersburg State University, Saint Petersburg, Russia. ³⁴¹School of Anthropology and Museum Ethnography, University of Oxford, Oxford, UK. ³⁴²Center for Social and Cultural Psychology, Université Libre de Bruxelles (Free University of Brussels), Brussels, Belgium. ³⁴³School of Psychology, University of Auckland, Auckland, New Zealand. ³⁴⁴Centre for Brain Research, University of Auckland, Auckland, New Zealand. ³⁴⁵School of Geography, Politics and Sociology, Newcastle University, Newcastle upon Tyne, UK. ³⁴⁶ESRC Centre for Population Change, University of Southampton, Southampton, UK. ³⁴⁷Department of Management, Ben-Gurion University of the Negev, Beer Sheva, Israel. ³⁴⁸School of Psychology, University of Leeds, Leeds, UK. ³⁴⁹Leeds NIHR Biomedical Research Centre, Leeds, UK. ³⁵⁰Department of Psychology, University of Bern, Bern, Switzerland. ³⁵¹GESIS Leibniz Institute for the Social Sciences, Mannheim, Germany. ³⁵²Departamento de Psicología Cognitiva, Social y Organizacional, Universidad de La Laguna, San Cristóbal de La Laguna, Spain. ³⁵³Zurich Center for Neuroeconomics, Department of Economics, University of Zurich, Zurich, Switzerland. ³⁵⁴Department of Psychological Methods, Helmut Schmidt University Hamburg, Hamburg, Germany. ³⁵⁵Department of Sociology of Education, University of Bern, Bern, Switzerland. ³⁵⁶Karlsruhe University of Education, Karlsruhe, Germany. ³⁵⁷Institute of Neuroscience and Medicine (INM-7: Brain and Behaviour), Research Centre Jülich, Jülich, Germany. ³⁵⁸Institute of Systems Neuroscience, Heinrich Heine University Düsseldorf, Düsseldorf, Germany. ³⁵⁹Department of Linguistics, Cognitive Science and Semiotics, Aarhus University, Aarhus, Denmark. ³⁶⁰Neuroimaging Group, Cajal Neuroscience Center, CSIC, Madrid, Spain. ³⁶¹UMR Territoires, VetAgro Sup, AgroParisTech, INRAE, Université Clermont Auvergne, Lempdes, France. ³⁶²Department of Marketing, Istanbul Bilgi University, Istanbul, Turkey. ³⁶³Department of Neurology, University of Utah, Salt Lake City, UT, USA. ³⁶⁴Center for Crisis Early Warning, University of the Bundeswehr Munich, Neubiberg, Germany. ³⁶⁵Asylum and Migration Group, WODC (Research and Data Centre), The Hague, The Netherlands. ³⁶⁶Department of Humanities and Social Sciences, Indian Institute of Technology Bombay, Mumbai, India. ³⁶⁷University of Osnabrueck, Osnabrueck, Germany. ³⁶⁸Department of Social Psychology, University of Amsterdam, Amsterdam, The Netherlands. ³⁶⁹Vision & Cognition, Netherlands Institute for Neuroscience (KNAW), Amsterdam, The Netherlands. ³⁷⁰Department of Social Psychology, Helmut Schmidt University Hamburg, Hamburg, Germany. ³⁷¹University of Tübingen, Tübingen, Germany. ³⁷²Department of Biostatistics, University of Zurich, Zurich, Switzerland. ³⁷³Department of Communication Sciences and Disorders, Northeastern University, Boston, MA, USA. ³⁷⁴Research Centre Normative Orders, Goethe University Frankfurt, Frankfurt, Germany. ³⁷⁵Peace Research Institute Frankfurt (PRIF), Frankfurt, Germany. ³⁷⁶Department of Biomedical, Metabolic, and Neurological Sciences, University of Modena and Reggio Emilia, Modena, Italy. ³⁷⁷Department of Psychology, San Diego State University, San Diego, CA, USA. ³⁷⁸Sababi Institute, Hargeisa, Somaliland. ³⁷⁹Faculty of Social Studies, Department of Social Work, University of Ostrava, Ostrava, Czech Republic. ³⁸⁰Department of Environmental Social Sciences, Swiss Federal Institute of Aquatic Science and Technology (Eawag), Dübendorf, Switzerland. ³⁸¹Department of Psychology, Norwegian University of Science and Technology, Trondheim, Norway. ³⁸²School of Law and Politics, Cardiff University, Cardiff, UK. ³⁸³Political

Article

Science, University of Wisconsin–Madison, Madison, WI, USA. ³⁸⁴Department of Psychology, University of Liverpool, Liverpool, UK. ³⁸⁵Centre for Philosophy of Natural and Social Science, London School of Economics, London, UK. ³⁸⁶Institute of Human Sciences, University of Oxford, Oxford, UK. ³⁸⁷Calleva Research Centre for Evolution and Human Sciences, Magdalen College, Oxford, UK. ³⁸⁸Danish Research Centre for Magnetic Resonance, Department of Radiology and Nuclear Medicine, Copenhagen University Hospital Amager and Hvidovre, Hvidovre, Denmark. ³⁸⁹Department of Psychiatry and Psychotherapy, Ludwig-Maximilians-Universität München, LMU Munich, Munich, Germany. ³⁹⁰Department of Psychology, Stanford University, Stanford, CA, USA. ³⁹¹Department of Communication and Cognition, Tilburg University, Tilburg, The Netherlands. ³⁹²Department of Management, Université Paris Dauphine PSL, Paris, France. ³⁹³Center for Research in Economics and Statistics (CREST), ENSAE, Institut Polytechnique de Paris, Palaiseau, France. ³⁹⁴Carlos L. Tiu School of Economics, De La Salle University, Manila, The Philippines. ³⁹⁵School of Business, Economics, and Information Systems, University of Passau, Passau, Germany. ³⁹⁶Evidence-to-Impact Collaborative, Pennsylvania State University, University Park, PA, USA. ³⁹⁷Sensorimotor Neuroscience and Ageing Research Group, School of Psychological Sciences, College of Health and Medicine, University of Tasmania, Hobart, Tasmania, Australia. ³⁹⁸Menzies Institute for Medical Research, University of Tasmania, Hobart, Tasmania, Australia. ³⁹⁹Department of Cognitive and Psychological Sciences, Brown University, Providence, RI, USA. ⁴⁰⁰CNRS, Université Toulouse Capitole, Toulouse School of Management, Toulouse, France. ⁴⁰¹CNRS, Université Toulouse Capitole, Toulouse School of Economics, Toulouse, France. ⁴⁰²Department of Sociology, Radboud University, Nijmegen, The Netherlands. ⁴⁰³Department of Psychology, New York University, New York, NY, USA. ⁴⁰⁴Department of Psychology, National Research University Higher School of Economics, Moscow, Russia. ⁴⁰⁵Department of Psychology, Willamette University, Salem, OR, USA. ⁴⁰⁶School of Psychology, Aston University, Birmingham, UK. ⁴⁰⁷Department of Interdisciplinary Human Sciences, Texas Tech University, Lubbock, TX, USA. ⁴⁰⁸Escuela de Gobierno y Administración Pública, Universidad Mayor, Santiago, Chile. ⁴⁰⁹Department of Psychiatry, Department of Experimental Psychology, University of Oxford, Oxford, UK. ⁴¹⁰Department of Experimental Psychology, University of Granada, Granada, Spain. ⁴¹¹Mind, Brain and Behavior Research Center (CIMCYC), University of Granada, Granada, Spain. ⁴¹²Department of Psychology, Neuroscience and Behaviour, McMaster University, Hamilton, Ontario, Canada. ⁴¹³McMaster Institute for Music & the Mind - LIVELab, McMaster University, Hamilton, Ontario, Canada. ⁴¹⁴Faculty of Education, Charles University, Prague, Czech Republic. ⁴¹⁵Institute of Psychology, Czech Academy of Sciences, Brno, Czech Republic. ⁴¹⁶Department for Psychology, University of Bamberg, Bamberg, Germany. ⁴¹⁷Münster Center for Open Science, University of Münster, Münster, Germany. ⁴¹⁸School of Psychological Sciences, Macquarie University, Sydney, New South Wales, Australia. ⁴¹⁹Max Planck Institute for Behavioral Economics, Bonn, Germany. ⁴²⁰InsIDE Lab, Dipartimento di Economia, Università degli Studi dell'Insubria, Varese, Italy. ⁴²¹Cnr-Istituto di Linguistica Computazionale "Antonio Zampolli" (CNR-ILC), Pisa, Italy. ⁴²²Department of Psychology, University of Konstanz, Konstanz, Germany. ⁴²³Department of Ergonomics and Psychology, Budapest University of Technology and Economics, Budapest, Hungary. ⁴²⁴Computational Social Science, University of Chicago, Chicago, IL, USA. ⁴²⁵Melbourne School of Psychological Sciences, University of Melbourne, Melbourne, Victoria, Australia. ⁴²⁶Department of Human Sciences, University of Verona, Verona, Italy. ⁴²⁷Department of Economics and Social Sciences, BOKU University, Vienna, Austria. ⁴²⁸Lee Kong Chian School of Business, Singapore Management University, Singapore, Singapore. ⁴²⁹University Library, Iowa State University, Ames, IA, USA. ⁴³⁰Centre for Marine Science and Innovation, UNSW Sydney, Sydney, New South Wales, Australia. ⁴³¹Department of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy, University Hospital, LMU Munich, Munich, Germany. ⁴³²Department of Psychology, Ashland University, Ashland, OH, USA. ⁴³³School of Neurobiology, Biochemistry and Biophysics, Faculty of Life Sciences and Sagol School of Neuroscience, Tel Aviv University, Tel Aviv, Israel. ⁴³⁴Department of Psychology III, Julius-Maximilians-Universität Würzburg, Würzburg, Germany. ⁴³⁵Department of Psychology, University of Mannheim, Mannheim, Germany. ⁴³⁶Centre for Decision Research and Experimental Economics, School of Economics, University of Nottingham, Nottingham, UK. ⁴³⁷Department of Psychology, University of Mainz, Mainz, Germany. ⁴³⁸Educational Psychology Department, University of Utah, Salt Lake City, UT, USA. ⁴³⁹Center for Brain, Biology and Behavior, Department of Psychology, University of Nebraska–Lincoln, Lincoln, NE, USA. ⁴⁴⁰Department of Educational Sciences and Psychology, Freie Universität Berlin, Berlin, Germany. ⁴⁴¹Wu Tsai Neurosciences Institute, Stanford University, Stanford, CA, USA. ⁴⁴²MZES, University of Mannheim, Mannheim, Germany. ⁴⁴³Department of Sociology, University of Warwick, Coventry, UK. ⁴⁴⁴School of Politics and International Relations, Australian National University, Canberra, Australian Capital Territory, Australia. ⁴⁴⁵Department of Psychology, University of Innsbruck, Innsbruck, Austria. ⁴⁴⁶Division of Psychology and Language Sciences, University College London, London, UK. ⁴⁴⁷Department of Social Sciences and Policy Studies, Worcester Polytechnic Institute, Worcester, MA, USA. ⁴⁴⁸Faculty of Sport, Technology and Health Sciences, St Mary's University, Twickenham, London, UK. ⁴⁴⁹Key Laboratory of Brain-Machine Intelligence for Information Behavior (Ministry of Education and Shanghai), School of Business and Management, Shanghai International Studies University, Shanghai, China. ⁴⁵⁰Department of Economics, University of Essex, Colchester, UK. ⁴⁵¹School of Psychology, University of Sussex, Brighton, UK. ⁴⁵²Department of Psychology, San Diego State University, San Diego, CA, USA. ⁴⁵³Department of Quantitative Intelligence, Feinstein Institutes for Medical Research, New York, NY, USA. ⁴⁵⁴Social Research Institute, University College London, London, UK. ⁴⁵⁵School of Business and Economics, RWTH Aachen University, Aachen, Germany. ⁴⁵⁶Department of Experimental Psychology, University College London, London, UK. ⁴⁵⁷Department of Management, Society and Communication, Copenhagen Business School, Copenhagen, Denmark. ⁴⁵⁸Institute of Psychology, Osnabrück University, Osnabrück, Germany. ⁴⁵⁹Department of Social Sciences, Otto von Guericke University Magdeburg, Magdeburg, Germany. ⁴⁶⁰Faculty of Social Science, RPTU University of Kaiserslautern-Landau, Kaiserslautern, Germany. ⁴⁶¹Department of Educational Science, University of Groningen, Groningen, The Netherlands. ⁴⁶²School of Psychology, Keele University, Keele, UK. ⁴⁶³School of Business, Stevens Institute of Technology, Hoboken, NJ, USA. ⁴⁶⁴Centre for Fertility and Health, Norwegian Institute of Public Health, Oslo, Norway. ⁴⁶⁵Jackson School of Global Affairs, Yale University, New Haven, CT, USA. ⁴⁶⁶NSI, Inc., Washington, DC, USA. ⁴⁶⁷Department of Communication Studies, Northwestern University, Evanston, IL, USA. ⁴⁶⁸Department of Computer Science, Northwestern University, Evanston, IL, USA. ⁴⁶⁹Department of Marketing, Clemson University, Clemson, SC, USA. ⁴⁷⁰Department of Social & Human Research, Romanian Academy, Cluj-Napoca, Romania. ⁴⁷¹Department of Psychology, Babeş-Bolyai University, Cluj-Napoca, Romania. ⁴⁷²Institute of Psychology, Jagiellonian University, Krakow, Poland. ⁴⁷³Center for Law and Economics, ETH Zürich, Zurich, Switzerland. ⁴⁷⁴Education, Research, Statistics, and Evaluation, University of Virginia, Charlottesville, VA, USA. ⁴⁷⁵History and Art History, Utrecht University, Utrecht, The Netherlands. ⁴⁷⁶Graduate School of Advanced Science and Engineering, Hiroshima University, Higashihiroshima, Japan. ⁴⁷⁷Greenwich Business School, University of Greenwich, London, UK. ⁴⁷⁸Department of General Psychology, University of Padova, Padova, Italy. ⁴⁷⁹Institute of Physics Belgrade, University of Belgrade, Belgrade, Serbia. ⁴⁸⁰Leiden Institute of Brain and Cognition, Leiden University, Leiden, The Netherlands. ⁴⁸¹Donders Centre for Cognition, Radboud University, Nijmegen, The Netherlands. ⁴⁸²Business, LAB University of Applied Sciences, Lappeenranta, Finland. ⁴⁸³Visiting Researcher, LUT Business School, LUT University, Lappeenranta, Finland. ⁴⁸⁴Turku School of Economics, University of Turku, Turku, Finland. ⁴⁸⁵Department of Psychiatry and Behavioral Sciences, Stanford University, Palo Alto, CA, USA. ⁴⁸⁶Department of Sociology and Social Psychology, University of Cologne, Cologne, Germany. ⁴⁸⁷Research Group Neural Circuits, Consciousness and Cognition, Max Planck Institute for Empirical Aesthetics, Frankfurt, Germany. ⁴⁸⁸Department of Cognitive Neuroscience, Faculty of Psychology and Neuroscience, Maastricht University, Maastricht, The Netherlands. ⁴⁸⁹Human Resource Studies, Tilburg University, Tilburg, The Netherlands. ⁴⁹⁰Department of Psychology, University of Basel, Basel, Switzerland. ⁴⁹¹Department of Organizational Behavior, INSEAD, Singapore, Singapore. ⁴⁹²Independent Researcher, Sheffield, UK. ⁴⁹³Optentia Research Unit, North-West University, Vanderbijlpark, South Africa. ⁴⁹⁴Department of Sociology, Utrecht University, Utrecht, The Netherlands. ⁴⁹⁵Methodology and Statistics Unit, Institute of Child and Education Studies, Leiden University, Leiden, The Netherlands. ⁴⁹⁶Department of Economics, Lund University, Lund, Sweden. ⁴⁹⁷Department of Psychology, Ithaca College, Ithaca, NY, USA. ⁴⁹⁸DISTUM, Department of Humanities, University of Urbino Carlo Bo, Urbino, Italy. ⁴⁹⁹RCCS San Camillo Hospital, Lido Venice, Italy. ⁵⁰⁰Vaccine and Infectious Disease Division, Fred Hutchinson Cancer Center, Seattle, WA, USA. ⁵⁰¹Amsterdam School of Communication Research, University of Amsterdam, Amsterdam, The Netherlands. ⁵⁰²Nuffield College, University of Oxford, Oxford, UK. ⁵⁰³Economics, Newcastle University Business School, Newcastle upon Tyne, UK. ⁵⁰⁴Faculty of Medicine, Imperial College London, London, UK. ⁵⁰⁵Perceptive Discovery, Perceptive, London, UK. ⁵⁰⁶Arctic Centre, University of Lapland, Rovaniemi, Finland. ⁵⁰⁷Darden School of Business, University of Virginia, Charlottesville, VA, USA. ⁵⁰⁸Psychology, University of Michigan, Ann Arbor, MI, USA. ⁵⁰⁹Department of Information Systems, University of Cologne, Cologne, Germany. ⁵¹⁰Department of Psychology I, Clinical Psychology and Psychotherapy, Institute of Psychology, University of Würzburg, Würzburg, Germany. ⁵¹¹Stockholm Business School, Stockholm University, Stockholm, Sweden. ⁵¹²Leibniz Institute for Financial Research SAFE, Frankfurt, Germany. ⁵¹³Psychological Sciences, Western Kentucky University, Bowling Green, KY, USA. ⁵¹⁴University of Kentucky Medical School, Lexington, KY, USA. ⁵¹⁵Department of Psychological Sciences, Swinburne University of Technology, Melbourne, Victoria, Australia. ⁵¹⁶Department of Experimental Psychology, Ghent University, Ghent, Belgium. ⁵¹⁷Department of Psychology, Humboldt University of Berlin, Berlin, Germany. ⁵¹⁸Department of Business Economics, University of the Balearic Islands, Palma, Spain. ⁵¹⁹Institute of Applied Psychology, Jagiellonian University, Kraków, Poland. ⁵²⁰Cognitive Science Department, Central European University, Vienna, Austria. ⁵²¹Italian Institute of Technology, Genoa, Italy. ⁵²²Data and Analytics, Texas State Technical College, Waco, TX, USA. ⁵²³Institute of Education (IOE), Department of Psychology and Human Development, University College London, London, UK. ⁵²⁴Cameron School of Business, University of North Carolina Wilmington, Wilmington, NC, USA. ⁵²⁵Department of Psychology, Chinese University of Hong Kong, Hong Kong SAR, China. ⁵²⁶Neuroimaging Center (NIC), Focus Program Translational Neuroscience (FTN), Johannes Gutenberg University Medical Center, Mainz, Germany. ⁵²⁷Leibniz Institute for Resilience Research (LIR), Mainz, Germany. ⁵²⁸Department of General and Transplantation Surgery, Medical University of Warsaw, Warsaw, Poland. ⁵²⁹Department of Psychology, Ludwig-Maximilians-Universität München, Munich, Germany. ⁵³⁰Universitas Airlangga, Surabaya, Indonesia. ⁵³¹Department of Psychology, Ohio University, Athens, OH, USA. ⁵³²Research Group Neural Circuits, Consciousness, and Cognition, Max Planck Institute for Empirical Aesthetics, Frankfurt, Germany. ⁵³³Institute of Psychology, Goethe University of Frankfurt, Frankfurt, Germany. ⁵³⁴Department of Psychology, Claremont McKenna College, Claremont, CA, USA. ⁵³⁵U.S. Securities and Exchange Commission, Washington, DC, USA. ⁵³⁶Department of Psychology, University of Milano-Bicocca, Milan, Italy. ⁵³⁷Department of Economics, Ben-Gurion University of the Negev, Beer Sheva, Israel. ⁵³⁸Center for Open Science, Washington, DC, USA. ⁵³⁹University of Virginia, Charlottesville, VA, USA. ⁵⁴⁰Present address: Neuroscience Program, Champalimaud Center for the Unknown, Lisbon, Portugal. ⁵⁴¹Present address: Chair for AI in Healthcare and Medicine, Technical University of Munich (TUM) and TUM University Hospital, Munich, Germany. ⁵⁴²Present address: Munich Center for Machine Learning (MCML), Munich, Germany. ⁵⁴³These authors contributed equally: Balazs Aczel, Barnabas Szasz.

Methods

All methods and procedures in this study were reviewed by a panel of experts with previous experience in multi-analyst studies or who are specialists in the relevant methodology (see Supplementary Information for further methodological details).

Preregistration

The methods, materials, analysis plan, peer evaluation and data management strategy of the project were preregistered on the OSF. Deviations from the registered plan are reported and explained in 'Deviations from preregistration' in the Supplementary Information.

Ethical considerations. The datasets resulting from this project were not considered human subject research and are covered under an umbrella ethics protocol that was managed by the Center for Open Science (BRANY SBER IRB protocol no. 21-056-749), with concurrence from the US Naval Information Warfare Center Pacific, Human Research Protection Official. The institutional ethics board of the Faculty of Education and Psychology at Eötvös Loránd University determined that the reanalysts are not considered research participants and that the project raises no ethical concerns.

Materials

Selection of studies. The selection of studies was completed in two stages. In the first stage, the Systematizing Confidence in Open Research and Evidence (SCORE) team created an initial study and claim collection. From this collection, we selected our sample using further criteria.

In the SCORE project, a stratified random sample of 600 articles was identified from a larger pool of approximately 30,000 randomly stratified articles across 62 journals published between 2009 and 2018. The journals covered the main branches of social and behavioural sciences (criminology, economics, education, health-related, marketing/organizational behaviour, management, political science, psychology, public administration and sociology). To obtain the original studies, the following steps were taken: first, each paper was reviewed. If data and/or code were available, they were downloaded and saved into a project on OSF. If data and/or code were not available, the SCORE team attempted to contact the corresponding authors to request that they share the data and code used for the original publication. Studies were excluded from the sample if they did not contain at least one inferential test using non-simulated human data, in which human data are defined at any level of human organization (such as the individual person, family, political entity, firm and economic unit). Most of the studies were tested for analytical reproducibility using the original specification, which is to be distinguished from robustness to alternative specifications. Analytical reproducibility was tested in cases when both original data and code were available ($n = 63$) or when the original data were available but the original code had to be adapted by the SCORE team to successfully reproduce the result ($n = 7$). If data were available but the original code was not, SCORE sourced a collaborating laboratory to generate a new analytical code for the reproduction ($n = 10$). If data and code were not available, the collaborating laboratory used the secondary source data, which were shared upon request (acquired by SCORE), alongside the newly generated analytical code for the reproduction ($n = 11$). Some reproductions were not attempted ($n = 9$). If the analytical reproduction failed, the paper was removed from the pool. Therefore, the present project focused solely on robustness to alternative specifications and did not conduct direct reproducibility checks using the original specification, because these had already been carried out by SCORE. Further details of the SCORE methodology (list of journals, selection process and so on) are available in the original report (A. L. Abatayo et al., manuscript in preparation).

In this study, a further requirement of the selected studies was to contain a single inferential statistical test result that corresponded to

the claim with our instructions. Thus, we ensured that given the claim and the instructions, no other statistical result could correspond to the claim in the original article. If all potential claims from the study were too ambiguous and, therefore, could not be linked with a single inferential test statistic with the specification instructions, the study was excluded from our sample. The aforementioned study selection process was continued until we reached our target number of 100 studies, corresponding claims and datasets.

The selected studies and all available corresponding data and materials were made available to the reanalysts so that they could fully understand the selected claim and approach. There are trade-offs for how much information to give to the reanalysts to conduct reanalyses. Complete blinding of the original analysis strategy would ensure an entirely independent decision-making process about how to analyse the data. However, in much scientific writing, there is insufficient clarity in the description of the theoretical background, rationale and specification of the conceptual model to be tested. In some papers, there is a clean break between these and clear hypotheses to test. In other papers, the narrative intermixes theoretical statements and analysis decisions and may not clearly state hypotheses or how they correspond with observed results. As a consequence, attempts to blind papers inevitably lead to variation in what is blinded across papers and many subjective decisions about what should be blinded (because it provides information about analysis strategy) and what can remain unblinded (because it provides information about theory and rationale). A major risk of those blinding decisions is that important information could be removed, which would weaken the reanalysts' ability to conduct a fair reanalysis of the original claim. As such, we opted for complete transparency of the original article so that no potentially important information was missing for the reanalysts, and we instructed reanalysts that they should create an analysis plan on the basis of their own decisions for how best to assess the study's claim. On balance, this increases the risk of dependent decision-making but reduces the risk of misspecification of the hypothesis and rationale of the original research. In this context, we judged the latter to be a more important precondition for conducting an informative study.

Claim selection. Claim selection was built on phase 1 of the SCORE project effort. The claims identified for phase 1 of SCORE were executed according to a 'single trace' approach, in which only a single claim trace was extracted from the article, which corresponded to one statistically significant inferential test result⁴⁵. Within the current project, first, the lead team ensured that the extractions were understandable, contained only one claim and indicated the direction of the effect; a statistical hypothesis test-based result was provided in the article, which corresponded to the claim; and the claim was phrased on a conceptual rather than statistical level. If not, they extracted the part of the claim that was relevant; if this could not be achieved, they selected another more suitable sentence from the abstract, and if this could not be achieved, they searched for another suitable sentence from other parts of the article that could satisfy all of our criteria. When none of these steps presented a claim that satisfied the expectations, the article was excluded from our study (for the list and explanation of exclusions, see Supplementary Information). When the lead team judged an expression of a claim to be ambiguous or rhetorical, they replaced the expression with an ellipsis mark (for example, 'dramatically increased' to '...increased') while preserving the original wording and meaning of the claim. Only when the selection rendered the wording of the claim complicated, ungrammatical or marked by an ambiguous definition or unexplained abbreviation did the core team make necessary (and marked) adjustments in the grammar or wording of the claim while preserving the original meaning of the extraction. For example, the selection "Three factors increase the salience of the proliferation threat: (1) prior violent militarized conflict..." was changed to "[prior violent militarized conflict] increase[s] the salience of the proliferation threat...". The list of claims can be found at <https://osf.io/mkwhn>.

Article

Analysis instructions. For the reanalysts' second task, instructions were needed in cases in which the original paper contained more than one statistical analysis corresponding to the high-level claim to compare the new result to that in the original paper. For this, the lead team prepared certain instructions (for example, data selection and exclusions) that singled out only one statistical result in the original paper. The instructions always remained circumstantial (for example, data selection, exclusions and choice of measurement) and never gave direct instructions as to the choice of statistical approach or full specification of the model.

Procedures

Reanalyst recruitment. Our preregistered aim was to have at least five independent reanalyses carried out for each of the 100 selected studies (Extended Data Fig. 5). Our choice of five analyses per study was guided by practical considerations, because we judged that recruiting 500 analysts for a project was the limit of our capacity.

Participation in the project was advertised on social media, at conferences, in mailing lists (such as SCORE collaborator list), through personal networks and in research newsletters. As a response to our recruitment call, 1,141 researchers signed up to participate in our study. Of these volunteers, 459 signed up to analyse at least one dataset and submitted their work by the deadline or an extended deadline. From all the eligible volunteers, we selected reanalysts and peer evaluators on a first-come first-served basis. The expectation for participation in the study was experience in conducting statistical analyses, and this was communicated to the volunteers from the start of recruitment. Reanalysts were informed that they would qualify as authors on the publication of this study if (1) they completed their analyses and submitted all required materials and post-analysis surveys on time; (2) their analyses passed the peer evaluation; and (3) they reviewed and approved the manuscript in time.

Reanalysts received a flat fee of US\$100 for each of their completed reanalyses (including tasks 1 and 2) if they submitted their work before March 2023, the deadline of the grant budget, unless they were from an embargoed country, in which case we were unable to transfer any payment. Peer evaluators received a flat fee of US\$10 per peer evaluation. Any further volunteers were informed that this payment did not apply to them.

Upon joining the project, the volunteers for reanalysis were required to accept the project requirements. They were informed about (1) their tasks and responsibilities; (2) the project confidentiality agreements; (3) the plans for publishing the research report and presenting the data, analyses and conclusion; (4) the conditions for an analysis to be included or excluded from the study; (5) that their names will be publicly linked to the analyses; (6) the reanalysts' rights to update or revise their analyses; (7) the project time schedule; and (8) the nature and criteria of compensation. Reanalysts were informed that, although they could consult other researchers during their analyses, they could not work in teams within this project. Before discussing the details of the analyses with others, the reanalysts were asked to ascertain that the person was not another reanalyst on that dataset. All communication materials of this study are openly available on the public repository of the project at <https://osf.io/q5h2c/>.

Assignment of analyses and tasks. The following procedure was first piloted with two analysts to learn about the practical challenges and time demands of the following tasks. The results of these analyses were not of central interest; therefore, we kept no records of them.

First, each reanalyst was asked to assign themselves to one study, but at later rounds of recruitment, we allowed reanalysts to complete analysis on another paper other than the one they completed earlier. They were asked to choose studies in which they saw the greatest relevance of their expertise. The authors of the original study could not be the reanalysts of that study.

For several practical reasons, the reanalyses were not started at the same time for each study and each analyst. First, it took us several rounds of recruitment to gather the target number of analyses for each study, mainly owing to dropouts, delays, unplanned personal difficulties and a shortage of staff. Second, our analysts found it difficult to retrieve, open or interpret some of the datasets. In some cases, we had to reach out to the original authors, causing further delays in the project.

The task of the reanalysts was to reflect on the corresponding claim (see claim selection) by reanalysing the corresponding data. The reanalysts were provided with access to the datasets, extracted claims, the original articles and all the corresponding materials. They were informed that their analyses should be conducted preferably with scripts that could reproduce all their results (including data pre-processing, extraction of test statistics and *P* values/Bayes factors and computing effect-size measures), but they could use the statistical software of their choice to produce an analysis script. Reanalysts were asked to write and structure their code such that others could understand their analysis scripts (for example, by annotating the different analysis steps), and they were also informed that the analysis scripts from all analysts would be made publicly available with their names linked to the analyses.

Reanalysts received two main tasks for each study, in which task 2 was given after the completion of task 1. Once task 1 was submitted, the analysts could not change the submission of task 1 unless they were asked by the lead team to provide some missing information from their analysis.

In task 1, the reanalysts were asked to reflect on the selected claim by reanalysing the corresponding data. They could conduct and report as many analyses as they wished, but they had to draw a single conclusion from their analysis. They were asked to report their analyses and indicate whether their results provided evidence for the relationship/effect as claimed by the original study.

In task 2, the reanalysts had to produce only one statistical result corresponding to the claim they studied in task 1, which would be compared with a statistical result in the original paper. The lead team provided certain instructions (for example, data selection and exclusions) for this analysis to be able to compare the new result with one result in the original paper (see 'Analysis instructions' section). Reanalysts were asked to report their results in terms of statistical families of *r*, *z*-test, *t*-test, *F*-test or χ^2 test (or their non-parametric versions). In addition, they were asked to report sample sizes (for example, per group) and the corresponding degrees of freedom. By this means, most results could be translated into standardized coefficients by the coordinators.

The reason for requiring two analyses from the reanalysts was that they served two different aims. The results of task 1 aimed to answer our first preregistered project question ('Do different analysts arrive at the same conclusions as the analyst of the original study?'), whereas the results of task 2 aimed to answer our second preregistered project question ('Do different analysts arrive at the same effect estimates as the analyst of the original study?'). We found that asking only one of the tasks would not have been sufficient to fully address both questions. In task 1, researchers were not constrained to one analysis; therefore, they could have produced more than one statistical result to draw a conclusion from the dataset. Therefore, in task 1, it was not guaranteed that we would be able to select a single effect size from each analyst to answer our second project question. Another challenge in answering our second question was that in some of the original articles, one claim could have had more than one corresponding statistical result listed. In these cases, we prepared instructions for task 2 to single out only one statistical result in the original paper. For example, if the original study contained two corresponding regression models (one with some exclusions and one with no exclusions), we chose one of them (for example, the latter) and instructed the reanalysts not to apply any exclusions to the analysed data. In all other regards, the reanalysts were free to conduct their calculations according to their best judgement.

After completing the analysis and writing up the methods, results and conclusion, the reanalysts were expected to upload their analysis code (if available) to the corresponding OSF folder. Their reported methods, results and conclusions were collected through an online form (<https://osf.io/q5h2c/>). When uploading the materials, they were also asked to fill out a post-analysis survey. All major communications between the core project team and the reanalysts from the study are openly available on the public repository of the project.

Peer evaluations

The goal of peer evaluation in this project was to assess whether the applied analytical choices were acceptable and whether the reported conclusion followed from the statistical results. By acceptable, we mean that peer evaluators agree that the analysis pipeline is within the variations that could be considered appropriate by the scientific community in addressing the given analytical task.

The peer evaluation phase did not address potential errors in translating the description of the analytical methodology into analysis scripts. To mitigate potential gross errors in the analysis, the peer evaluators were provided with a thorough and standardized description of the results and conclusions obtained using the described analysis, including sample sizes, effect size, test statistic and degrees of freedom. From descriptions of the dataset and analysis and the reported results and conclusions, the peer evaluators were able to identify potential flaws in the implementation of the analysis that could stem from errors and/or mismatches.

Assignment of the analyses. When assigning the volunteer peer evaluators to analyses, the initial rule was that they should not evaluate any reanalyses conducted on datasets they had reanalysed as a reanalyst. In practice, for logistical reasons, this rule was applied in all but six cases (99% of peer evaluations were carried out on a dataset that was different from the dataset they analysed themselves). They were asked to evaluate the analyses in which they saw the greatest relevance to their expertise. Peer evaluators who, after choosing a study, did not feel adequately skilled or experienced to judge whether the proposed analysis was acceptable were told to leave the template blank, return the reanalysis to the pool and choose another study.

Peer evaluation procedure. For details, see the corresponding section in the Supplementary Information.

Analysis methods

This exploratory study contains no inferential statistics. In addition to the frequency-based and proportion-based summary statistics, we calculated only the effect sizes of the results from the original articles and reanalyses.

Cohen's *d* effect sizes. Following our preregistration, we converted all results into Cohen's *d* values wherever possible. For a number of cases, we could not achieve this owing to missing information in the original studies or reported statistics that cannot be converted into Cohen's *d* (for example, logistic regression). All conversions are listed in the R scripts and data documentation. All original effect sizes are reported as positive values, whereas the reanalysis effect sizes are negative only when they indicate an opposite effect compared with the original study.

For further information on methods, see Supplementary Information.

Reporting summary

Further information on research design is available in the Nature Portfolio Reporting Summary linked to this article.

Data availability

Study data and materials are available on the project OSF (<https://osf.io/q5h2c/>) and GitHub repositories (<https://github.com/marton-balazs-kovacs/multi100/>). Archived data include the original datasets or a description of how to gain access to them. Our shared materials include all the survey questions and the general communication texts and instructions that we sent to the reanalysts and peer evaluators. We excluded from our data files the email addresses of the reanalysts and the records of those analysts who did not comply with the instructions and did not submit all the required analyses by the deadline. For further details about our exclusion criteria and procedure, see the Supplementary Information.

Code availability

All analysis codes for this project are available at <https://github.com/marton-balazs-kovacs/multi100>.

45. Abatayo, A. L. et al. Assessments of credibility in the social and behavioural sciences. Preprint at *MetaArXiv* http://doi.org/10.31222/osf.io/7u58q_v1 (2026).

Acknowledgements We thank L. Caron, who contributed to the reanalyses but did not wish to be listed as an author; D. Sun, who contributed to the reanalyses; P. Czinger, J. Harangozo and M. Kolozsvari for their assistance with data review and preparation; and M. Latz for helping with our graphic designs. We gratefully acknowledge the support provided by the following institutions and grants: 016.Vidi.188.001 to D.v.R.; APVV-22-0458 and PRIMUS/24/SSH/017 to M. Adamkovic; Amsterdam Brain and Cognition (project grant 22) and 2024 Ammodo Science Award to A. Sarafoglou; Comisión Nacional de Investigación Científica y Tecnológica (CONICYT/FONDECYT Regular 1211373) to G. Navarrete; Czech Science Foundation (grant no. GA24-11974S) to D. Lacko; Defense Advanced Research Projects Agency cooperative agreement nos. HR00112020015 and N660011924015 to T.M.E. and B.A.N.; Deutsche Forschungsgemeinschaft (DFG) through the CRC TRR 190 'Rationality and Competition' (280092119) to C.B.-R.; DFG grant/award no. 402170461 (TRR 265) to H.T.C.; DFG grant no. 440923825 to S.D.-S.; Deutscher Akademischer Austauschdienst (ref. no. 91803023) to R.A.Z.; Dipartimento di Eccellenza 2023-2027, DIECO_DDE_2023-2027 to M. Rusconi and R.S.; ESRC grant ES/T015357/1 to C.S.; ESRC grant ES/Y002482/1 to D.R.S.; European Union's NextGenerationEU, Mission 4 Component 1 CUP J53D23007960006 and J53D23017140001 to I.M.; European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement no. 665501, Flemish Science Foundation (FWO; FWO.KAN.2019.0023.01) and Special Research Fund of Ghent University to D.W.; Excellence Fund of ELTE Eötvös Loránd University and the János Bolyai Research Fellowship of the Hungarian Academy of Sciences to T.N.; Fonds National pour la Recherche Scientifique to Y.L.M.; FWO.3E0.2021.0085.01 to J.V.A.; German Research Foundation (CRC TR224, Project A04) and Joachim Herz Stiftung to F.R.; German Research Foundation (grant no. SCHM 3460/3-1) to X.S.; Spanish Government (grant nos. RYC2021-033763-I and PID2023-150034OA-I00) to G. Niso; HSE University Basic Research Program to D. Grigoryev; INSEAD R&D committee to E.L.U.; Insight Grant \$435-2024-0336 and Social Sciences and Humanities Research Council of Canada to E.C.; Institute of Museum and Library Services (grant no. LG-250130-OLS-21) to S. Alzahawi; John Templeton Foundation (grant ID 62631) to R.M.R.; Keynes Fund (JHVH), CRASSH Grant (climaTRACES Lab) and Cambridge Humanities Research Grants to R.D.; Knut and Alice Wallenberg Foundation, Marianne and Marcus Wallenberg Foundation and Jan Wallander and Tom Hedelius Foundation to A.D.; Leverhulme Trust Early Career Fellow (RM56G0344) to M.M.E.; Ministry of Education in China Project of Humanities and Social Sciences (24YJA190001) to H.D.; MSCA-PF to C.M.G.; NIAAA (R01AA030283) and NSF (BCS 2237795) to J. Hogeveen; NIHR Manchester Biomedical Research Centre (NIHR203308) to I.R.J.; NSF GRFP (DGE 2139754) to P. McKee; Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO) Domain Social Sciences and Humanities Starter Grant to E.M.M.; NWO Veni VI.Veni.222.217 to P. Papale; NWO Vici (grant no. 181.029) to N.N.N.v.d.; National Science Center (2021/41/B/HS6/03104) to A. Gasiorowska; NextGenerationEU to R.L.-B.; Program FUTURE LEADER of Lorraine Université d'Excellence within the program Investissements Avenir (ANR-15-IDEX-04-LUE) operated by the French National Research Agency to S. Massoni; RVO 68081740 to F.D. and J. Lukavsky; SCALUP ANR (grant ANR-21-CE28-0016-01) to J. Pfänder; Singapore Ministry of Education Tier 1 Grant (MSS22B011) and Tier 2 Grant (MM22B03) to M. Schaerer; Mediated Society (MEDIS:ON) CZ.02.01.01/00/23_025/0008713, co-financed by the European Union, Slovak Research and Development Agency under contract no. APVV-23-0421 and NPO Systemic Risk Institute (LX22NPO510) to I. Ropovik; Stanford Center for Mind, Brain, Computation and Technology to S.T. Schwartz; Stone Program in Wealth Distribution, Inequality, and Social Policy at Harvard University to M.M.A.; Swedish Research Council (2020-02584) to P. Pärnamets; Swiss National Science Foundation (grant no. PZ00P1_201956) to A.N.M.; The DFG (German Research Foundation) under Germany's Excellence Strategy – EXC 2002/1 'Science of Intelligence' (project no. 390523135) to V. Chirkov; The Wellcome Trust (206480/Z/17/Z) to A. Boldt; European Union under the Research Excellence for Region Sustainability and High-tech Industries (project no. CZ.10.03.01/00/22_003/0000048) through the Operational Programme Just Transition to B.P.; UKRI BBSRC (BB/X008428/1) and Leeds NIHR Biomedical Research Centre (NIHR203331) to F.M.; Université Libre de Bruxelles (Mini-ARC) to G. Cortazzoli; Social Sciences and Humanities Research Council Insight Development Grant (430-2022-00087) to Y.A.W.; French National Research Agency ANR, 'Investissements d'Avenir' (LabEx Ecodec/ANR-11-LABX-0047) grant to P. Präg; Interdisciplinary Exploratory Synergy grant from the Novo Nordisk

Article

Foundation (NNF20OC0064869) to S.R.S.; NSF SBE Postdoctoral Research Fellowship (award no. 2104629) to J.F.G.M.; National Natural Science Foundation of China (grant nos. 72371165, 71971199 and 71942004) to Q.S.; DFG (German Research Foundation) GRK 2277 (project no. 310365261) to M.R.S.; European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement no. 101023805 to D.T.; funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie Actions Global Postdoctoral Fellowship (project no. 101149355) to R.R.-C.; Foundation for Polish Science START scholarship to M. Kowal; National Natural Science Foundation of China (grant nos. 72173113 and 72322009) and Zhejiang Provincial Philosophy and Social Sciences Planning Project (23SYS042Z) to F.C.; OTKA FK 146604 research grant to A.M.A.; Project 'European Brain Research Infrastructures-Italy' granted by the European Union's NextGenerationEU adopted by the Italian Ministry of University and Research (CUP B51E22000150006) to A. Antonietti; Region Hovedstadens Forskningsfond til Sundhedsforskning (grant agreement no. A7118) to A. Plachti; Research Council of Norway through its Centres of Excellence funding scheme (no. 262700) to H.F.S.; Slovak Research and Development Agency under contract nos. APVV-22-0458 and APVV-23-0548 to P. Kačmár; Proyecto de Generación de Conocimiento de la Agencia Estatal de Investigación (PID2023-150898OB-I00) to A. Arenas; project of the Minister of Science and Higher Education 'Support for the activity of Centers of Excellence established in Poland under Horizon 2020' on the basis of contract no. MEIN/2023/DIR/379, European Union's Horizon 2020 research and innovation programme under grant agreement no. 857533 and Sano project carried out within the International Research Agendas programme of the Foundation for Polish Science, co-financed by the European Union under the European Regional Development Fund to C. Koba; Social Sciences and Humanities Research Council of Canada Insight Grant (435-2024-0336) to E.C.; János Bolyai Research Fellowship of the Hungarian Academy of Sciences to Z.K.; Swiss National Science Foundation (grant nr. 215002) to S.N.; UKRI Horizon Europe funding guarantee (EP/X042758/1) to J.P.R.; FPU18/04805 by the Spanish Ministry of Universities to R.L.N.; Agencia Estatal de Investigación (PID2023-152226NB-I00) to T.K.A.W.; Research Foundation Flanders (FWO, grant no. 12D1523N) to A. Godefroidt; the UKRI BBSRC (BB/X008428/1) and the National Institute for Health and Care Research (NIHR) Leeds Biomedical Research Centre (BRC) (NIHR203331) to F.M.; BMBF Professorinnenprogramm via the professorship of T. Lange to F.L.; German Research Foundation (DFG) (BO3139/7) to J.C.W. The Center for Crisis Early Warning (Kompetenzzentrum Krisenfrüherkennung) is funded by the German Federal Ministry of Defense and the German Federal Foreign Office. The views and opinions expressed in this article are those of the author(s) and do not necessarily reflect the official policy or position of any agency of the German government. J.M.S. is funded by the European Research Council under the European Union's Horizon 2020 research and innovation programme (grant nos. 802227 to E.M. Merz and 10102045 to S. Gächter).

Author contributions Conceptualization: B.A., B. Szasz, F. Holzmeister, S. Hoffmann, G. Nilsson, L.K., Z.A.T., E.-J.W., T.M.E. and B.A.N. Data curation: H.T.C., M. Kovacs, M.A.V. and F. Venczel. Formal analysis: B.A., B. Szasz, H.T.C., M. Kovacs, F. Holzmeister, Dv.R., H.S.-K., S. Hoffmann, G. Nilsson, Y.A., C.L.A., O.A.A., M. Adamkovic, T. Adamovich, K.A., A.M.A., A.S.A.-B., A.H.A.-H., C.J.A., P.J.A., T. Alsalti, M. Altman, S. Alzahawi, E. Ambrosini, S. Anafinova, R.A., M. Angerer, A.A.-B., A. Antonietti, J.A., A. Arenas, M.M.A., F.A., M. Bachl, B. Bago, Š.B., B.J.B., E. Balayan, C.L.B., B. Banai, K.B., F.B., E. Baskin, N. Bault, C.W.B., Q.H.B., M. Behnke, T.B., S.B., A. Bernard, U.B., P.A.B., A. Boldt, C.B.-R., A. Bouaymourn, O.B., L.B., J. Breuer, R.B., H.B., E. Buchanan, J. Buckenmaier, J. Buckley, M. Burghart, B.H.B., N. Byrd, V. Cafarelli, P.C., T.C., K.C., A.M.C., G. Cepaluni, E.C., J.J.C., C.-c.C., X.C., S.S.C., F.C., H.C., V. Chirkov, D.C., B.C., S.G.C., C. Cohen, J. Collins, S.W.C., G. Corlazzoli, J. Cummins, C. Czymara, J.D.h., A.D.R., A.M.B.D., C.P.D., M.V.D., F.D.K., J.R.d.L., T.R.d.V., R.D., F.D., E.E.D., M.D., V.D., S.D.-S., S.D., L.D., J.D., A.R.D., H.D., J.E.E., A.E., E. Efendić, J.E., M.M.E., M.E., E. Estrada, L.E., T.R.E., A.F., E.M.F., L.F., F.M.F., J.L. Fiechter, M. Fišar, P.E.F.-K., M. Folwarczny, J.L. Fossum, V.R.F., R.F., D.F., J.F., A.C.F., J.D.G., L.C.G., C.M.G., B.G., S.M.G., A. Gasiorowska, B.G.P., R.G., A. Geminiani, D. Geraldes, C. Gian, E.G., V.G., T.G., A. Godefroidt, B.G.-B., A. Goreis, L.G.-V., M.G., D. Grigoryev, S.G., D.J.G., J.F.G.M., C. Guichet, L.G., H.H., A.C.H., S. Hafenbrädl, C. Häffner, F. Hagemeister, M. Haigh, N. Hajdu, N. Hajimoladarvish, J.D.H., M. Hamjediers, R.M.H., M. Harma, N.R.H., Á.D.H., R.H.H., A.H., Ø.H., D.H., T. Heyman, J. Hicks, J. Hogeveen, J. Höppler, S.D.H., C. Huber, C. Hughes, T. Hummler, K.H., M.I., T.I., O.I., K.I., I.R.J., A. Jahn, M. Jain, A. Jakubow, D.J., J.J., M. Jekel, F.J., W.J.-L., R.J., A. Jones, S.J., P. Kačmár, C. Kaiser, Y. Kalayci, J. Kantorowicz, A. Karabulut, J.D. Karch, H.K.-R., J.A.K., A. Kažemekaitytė, A. Kazlou, Z.K., J. Kim, B.K.-D., K.N.K., J.W.K., C. Koba, M. Kotczyńska, P. Kolias, M.K.G., M. Korbmacher, Ž.K., M. Kowal, A. Kretschmar, V.K., A.-M.K., M. Kubsch, Y. Kunisato, D. Lacko, J.R.L., M. Lange, H.L., D. Lee, S. Lee, E.P.L.J., D. Lempert, A. Leo, E.L., J.M.L., P. Li, J. Lin, L.L., D. Lisovoj, M. Liu, S. Liu, T.L., S.L.I., P. Lodder, R.L.-B., R.L.-N., K.L., N.M.L., A. Lovakov, J.G.L., J. Ludwig, F.L., J. Lukavský, C.Q.L., X.L., E.M., M. Máčel, M.L.M., C.R.M., A. Mädebach, J.M.-K., D.J.M., I.M., T.M., M.M. Marini, D.M.F., M. Martínez, M. Martinoli, A. Masiliunas, S. Massoni, K.C.M., S. Mayer, D. Mayer, M. Mayer, E.M.M., I.M.M., A.L.M., M.M. McIntyre, P. McKee, A.N.M., P.F.M., H.M., C. Merkle, R.M., M.P.M., P. Michaelsen, G.M., W.M., P. Millroth, K.G.M., M. Misiak, Y.L.M., D. Moreau, C. Moreh, C. Morvinski, F.M., T.N., C.N., E.N., G. Navarrete, S.N., A.N., R.N., M.N., E.N.-S., Y.A.N., G. Niso, B.N., M.O., K. Ong, A.I.O., C.O., K. Otten, S. Pandey, M. Pantazi, P. Papale, P. Pärnamets, S. Pauer, Y.G.P., S. Pawel, J.E.P., H.K.P., A. Peez, F.P., B.D.P., B.P., J. Petter, J. Pfänder, G.P., J. Phillips, M.T.P., A. Pirrone, I.L.P., A. Plachti, I.S.P., M. Ploner, M.M.H.P., S. Porcher, P. Präg, A.A.Y.P., J. Pugel, R.P., M. Püski, S. Radkani, L. Raes, I. Rafai, K. Raiber, S. Rathje, R. Reshetnikov, C.J.R., J.P.R., K. Rigaud, C.R., S. Rivera, O.R., R.R.-C., I. Ropovik, L. Röseler, R.M.R., A.R., F.F.R., F.R., M. Rusconi, I. Russo, A.H.J.S., J. Salamon, M. Samahita, A. Sanaei, A. Sangchooli, A. Sarafoglou, M. Scandola, H.S., M. Schaeerer, E. Schares, H.T.S., X.S., K.S., T.S., M.R.S., J.M.S., A.-L.S., B. Schuetz, D.H.S., L. Schulze, S.T. Schwartz, N.S., B. Scoggins, Y.S., R.S., D.R.S., S.T. Shaw, J. Shaw, Q.S., C.S., M. Sladekova, A. Somo, A. Sondhi, B. Sonmez, L. Spantig, M. Speekenbrink, A. Stamos, R.D.S.-C., E. Szumowska, A. Tacconelli, E. Talbert, J.P.T., J.N.T., M.T., E. Toffalini, A. Tomašević, S.T., L. Torkkeli, L. Tozzi, J.T., A. Trinidad, D.T., K.T., M.U., E.L.U., K.U., J.V.A., M.A.L.M.v.A., N.N.N.v.D., K.v.L., R.v.V., M.A.V., F. Venczel, M.V., P.V., A.V., E.V., F. Votta, A. Waldendorf, M.J.W., M.B.W., H.W., K.W., I.W., Y.A.W., M. Weinmann, M. Weiß, C.W., A. Wichman, B.J.W., D.W., T.K.A.W., M. Woźniak, J.D.W., W.Y., J.N.W., T.Y., S.K.Y., K.S.L.Y., M.Z., R.A.Z., X.Z., Z.Z., S.Z., C. Ziller, D.Z., C. Zogmaister, R.I.Z., N.F., T.M.E. and B.A.N.

D.H.S., L. Schulze, S.T. Schwartz, N.S., B. Scoggins, Y.S., R.S., S.T. Shaw, J. Shaw, Q.S., C.S., M. Sladekova, A. Somo, A. Sondhi, B. Sonmez, L. Spantig, M. Speekenbrink, A. Stamos, L. Stasielowicz, L.C.S., S.R.S., A.H.S., C.N.H.S., J.W.S., H.F.S., J. Sundquist, V.S., S.D.S., P.S., R.D.S.-C., E. Szumowska, A. Tacconelli, E. Talbert, J.P.T., J.N.T., M.T., E. Toffalini, A. Tomašević, S.T., L. Torkkeli, L. Tozzi, J.T., A. Trinidad, D.T., K.T., M.U., E.L.U., K.U., J.V.A., M.A.L.M.v.A., N.N.N.v.D., K.v.L., R.v.V., M.A.V., F. Venczel, M.V., P.V., A.V., E.V., F. Votta, A. Waldendorf, M.J.W., M.B.W., H.W., K.W., I.W., Y.A.W., M. Weinmann, M. Weiß, C.W., A. Wichman, J.C.W., B.J.W., D.W., T.K.A.W., M. Woźniak, J.D.W., W.Y., J.N.W., T.Y., S.K.Y., K.S.L.Y., M.Z., R.A.Z., X.Z., Z.Z., S.Z., C. Ziller, D.Z., C. Zogmaister, R.I.Z., N.F., T.M.E. and B.A.N. Investigation: L.A.V. Methodology: B.A., B. Szasz, H.T.C., M. Kovacs, F. Holzmeister, Dv.R., H.S.-K., S. Hoffmann, G. Nilsson, L.K., Z.A.T., C.J.A., J.A.B., R.B.-N., A.D., M.A.G., M.H.K., R.A.P., A. Sarafoglou, T.S., D.R.S., E.L.U., M.A.L.M.v.A., N.N.N.v.D., E.-J.W., T.M.E. and B.A.N. Project administration: B.A., B. Szasz, H.T.C., M. Kovacs, L.K., Z.A.T., N.F. and T.M.E. Resources: B.A., B. Szasz, H.T.C., F. Holzmeister, L.K., L.D., N.F., T.M.E. and B.A.N. Software: M. Kovacs. Supervision: B.A., B. Szasz, H.T.C., F. Holzmeister, Dv.R., S. Hoffmann, G. Nilsson, C.J.A., J.A.B., R.B.-N., A.D., M.A.G., M.H.K., A.N., R.A.P., A. Sarafoglou, T.S., D.R.S., E.L.U., M.A.L.M.v.A., N.N.N.v.D., E.-J.W., T.M.E. and B.A.N. Validation: X.C., D.D. and S.J. Visualization: B.A., B. Szasz, H.T.C. and M. Kovacs. Writing—original draft: B.A., B. Szasz, H.T.C., M. Kovacs and L.K. Writing—review and editing: B.A., B. Szasz, H.T.C., M. Kovacs, F. Holzmeister, Dv.R., H.S.-K., S. Hoffmann, G. Nilsson, L.K., Z.A.T., Y.A., C.L.A., O.A.A., E. Acem, M. Adamkovic, T. Adamovich, K.A., L.A., A.M.A., A.S.A.-B., A.H.A.-H., C.J.A., P.J.A., T. Alsalti, M. Altman, S. Alzahawi, E. Ambrosini, S. Anafinova, R.A., M. Angerer, A.A.-B., A. Antonietti, J.A., A. Arenas, M.M.A., F.A., M. Bachl, B. Bago, Š.B., B.J.B., E. Balayan, C.L.B., B. Banai, K.B., F.B., E. Baskin, J.A.B., N. Bault, C.W.B., Q.H.B., M. Behnke, T.B., S.B., A. Bernard, U.B., P.A.B., A. Boldt, C.B.-R., R.B.-N., A. Bouaymourn, O.B., L.B., J. Breuer, R.B., H.B., E. Buchanan, J. Buckenmaier, J. Buckley, J. Buczný, M. Burghart, B.H.B., N. Byrd, V. Cafarelli, P.C., T.C., K.C., A.M.C., G. Cepaluni, E.C., J.J.C., C.-c.C., X.C., S.S.C., F.C., H.C., V. Chirkov, D.C., B.C., S.G.C., C. Cohen, J. Collins, S.W.C., G. Corlazzoli, J. Cummins, C. Czymara, J.D.h., A.D.R., A.M.B.D., C.P.D., M.V.D., F.D.K., J.R.d.L., T.R.d.V., R.D., F.D., E.E.D., M.D., D.D., V.D., S.D.-S., S.D., L.D., J.D., A.R.D., A.D., H.D., J.E.E., A.E., E. Efendić, J.E., M.M.E., M.E., E. Estrada, L.E., T.R.E., A.F., E.M.F., L.F., F.M.F., J.L. Fiechter, M. Fišar, P.E.F.-K., M. Folwarczny, J.L. Fossum, V.R.F., R.F., D.F., J.F., A.C.F., J.D.G., L.C.G., C.M.G., B.G., S.M.G., A. Gasiorowska, B.G.P., R.G., A. Geminiani, D. Geraldes, M.A.G., C. Gian, E.G., V.G., T.G., A. Godefroidt, B.G.-B., A. Goreis, L.G.-V., M.G., D. Grigoryev, S.G., D.J.G., J.F.G.M., C. Guichet, L.G., H.H., A.C.H., S. Hafenbrädl, C. Häffner, F. Hagemeister, M. Haigh, N. Hajdu, N. Hajimoladarvish, J.D.H., M. Hamjediers, R.M.H., M. Harma, N.R.H., Á.D.H., R.H.H., A.H., Ø.H., D.H., T. Heyman, J. Hicks, J. Hogeveen, J. Höppler, S.D.H., C. Huber, C. Hughes, T. Hummler, K.H., M.I., T.I., O.I., K.I., I.R.J., A. Jahn, M. Jain, A. Jakubow, D.J., J.J., M. Jekel, F.J., W.J.-L., R.J., A. Jones, S.J., P. Kačmár, C. Kaiser, Y. Kalayci, J. Kantorowicz, A. Karabulut, J.D. Karch, H.K.-R., J.A.K., A. Kažemekaitytė, A. Kazlou, Z.K., J. Kim, M.H.K., B.K.-D., K.N.K., J.W.K., C. Koba, M. Kotczyńska, P. Kolias, M.K.G., M. Korbmacher, Ž.K., M. Kowal, A. Kretschmar, V.K., A.-M.K., M. Kubsch, Y. Kunisato, D. Lacko, J.R.L., M. Lange, H.L., D. Lee, S. Lee, E.P.L.J., D. Lempert, A. Leo, E.L., J.M.L., P. Li, J. Lin, L.L., D. Lisovoj, M. Liu, S. Liu, T.L., S.L.I., P. Lodder, R.L.-B., R.L.-N., K.L., N.M.L., A. Lovakov, J.G.L., J. Ludwig, F.L., J. Lukavský, C.Q.L., X.L., E.M., M. Máčel, M.L.M., C.R.M., A. Mädebach, J.M.-K., D.J.M., I.M., T.M., M.M. Marini, D.M.F., M. Martínez, M. Martinoli, A. Masiliunas, S. Massoni, K.C.M., S. Mayer, D. Mayer, M. Mayer, E.M.M., I.M.M., A.L.M., M.M. McIntyre, P. McKee, A.N.M., P.F.M., H.M., C. Merkle, R.M., M.P.M., P. Michaelsen, G.M., W.M., P. Millroth, K.G.M., M. Misiak, Y.L.M., D. Moreau, C. Moreh, C. Morvinski, F.M., T.N., C.N., E.N., G. Navarrete, S.N., A.N., R.N., M.N., E.N.-S., Y.A.N., G. Niso, B.N., M.O., K. Ong, A.I.O., C.O., K. Otten, S. Pandey, M. Pantazi, P. Papale, P. Pärnamets, S. Pauer, Y.G.P., S. Pawel, J.E.P., H.K.P., A. Peez, F.P., B.D.P., B.P., J. Petter, J. Pfänder, G.P., J. Phillips, M.T.P., A. Pirrone, I.L.P., A. Plachti, I.S.P., M. Ploner, R.A.P., M.M.H.P., S. Porcher, P. Präg, A.A.Y.P., J. Pugel, R.P., M. Püski, S. Radkani, L. Raes, I. Rafai, K. Raiber, S. Rathje, R. Reshetnikov, C.J.R., J.P.R., K. Rigaud, C.R., S. Rivera, O.R., R.R.-C., I. Ropovik, L. Röseler, R.M.R., A.R., F.F.R., F.R., M. Rusconi, I. Russo, A.H.J.S., J. Salamon, M. Samahita, A. Sanaei, A. Sangchooli, A. Sarafoglou, M. Scandola, H.S., M. Schaeerer, E. Schares, H.T.S., X.S., K.S., T.S., M.R.S., J.M.S., A.-L.S., B. Schuetz, D.H.S., L. Schulze, S.T. Schwartz, N.S., B. Scoggins, Y.S., R.S., D.R.S., S.T. Shaw, J. Shaw, Q.S., C.S., M. Sladekova, A. Somo, A. Sondhi, B. Sonmez, L. Spantig, M. Speekenbrink, A. Stamos, L. Stasielowicz, L.C.S., S.R.S., A.H.S., C.N.H.S., J.W.S., H.F.S., J. Sundquist, V.S., S.D.S., P.S., R.D.S.-C., E. Szumowska, A. Tacconelli, E. Talbert, J.P.T., J.N.T., M.T., E. Toffalini, A. Tomašević, S.T., L. Torkkeli, L. Tozzi, J.T., A. Trinidad, D.T., K.T., M.U., E.L.U., K.U., J.V.A., M.A.L.M.v.A., N.N.N.v.D., K.v.L., R.v.V., M.A.V., L.A.V., F. Venczel, M.V., P.V., A.V., E.V., F. Votta, E.-J.W., A. Waldendorf, M.J.W., M.B.W., H.W., K.W., I.W., Y.A.W., M. Weinmann, M. Weiß, C.W., A. Wichman, B.J.W., D.W., T.K.A.W., M. Woźniak, J.D.W., W.Y., J.N.W., T.Y., S.K.Y., K.S.L.Y., M.Z., R.A.Z., X.Z., Z.Z., S.Z., C. Ziller, D.Z., C. Zogmaister, R.I.Z., N.F., T.M.E. and B.A.N.

Competing interests N.F., T.M.E., and B.A.N. are or were employees of the non-profit organization Center for Open Science, which has a mission to increase openness, integrity and trustworthiness of research. The other authors declare no competing interests.

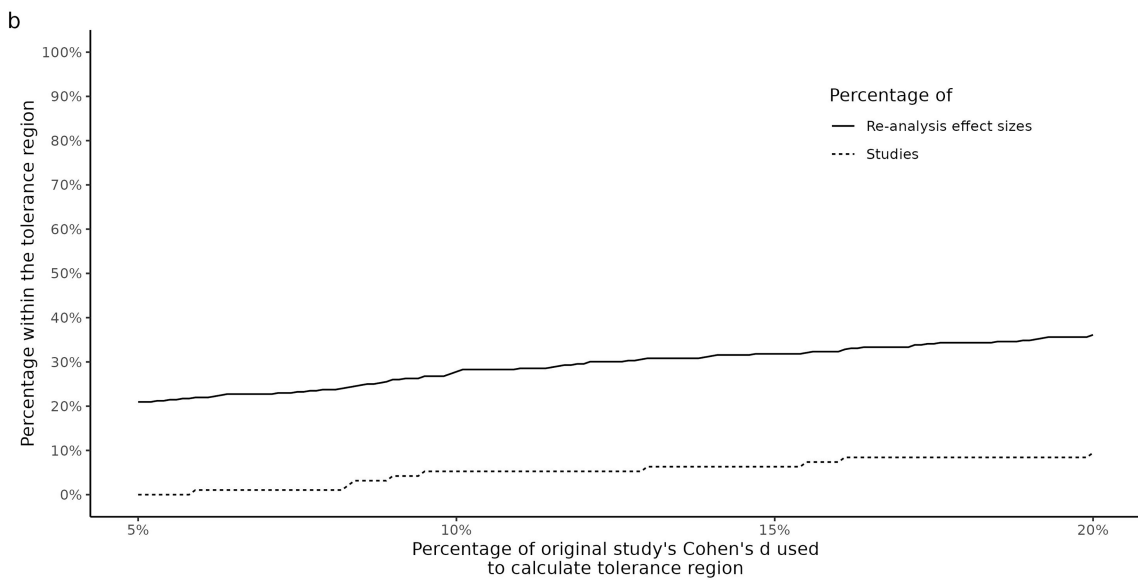
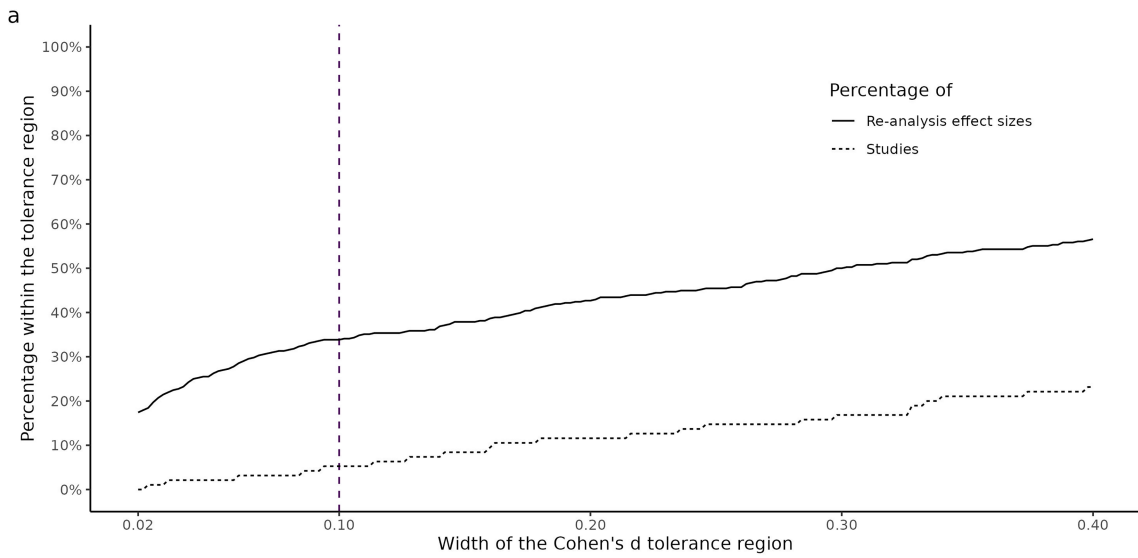
Additional information

Supplementary information The online version contains supplementary material available at <https://doi.org/10.1038/s41586-025-09844-9>.

Correspondence and requests for materials should be addressed to Balazs Aczel or Barnabas Szasz.

Peer review information *Nature* thanks Nate Breznau, who co-reviewed with Hung Nguyen; Cory Clark; and Jelte Wicherts, who co-reviewed with Benedikt Kretzler, for their contribution to the peer review of this work. Peer review reports are available.

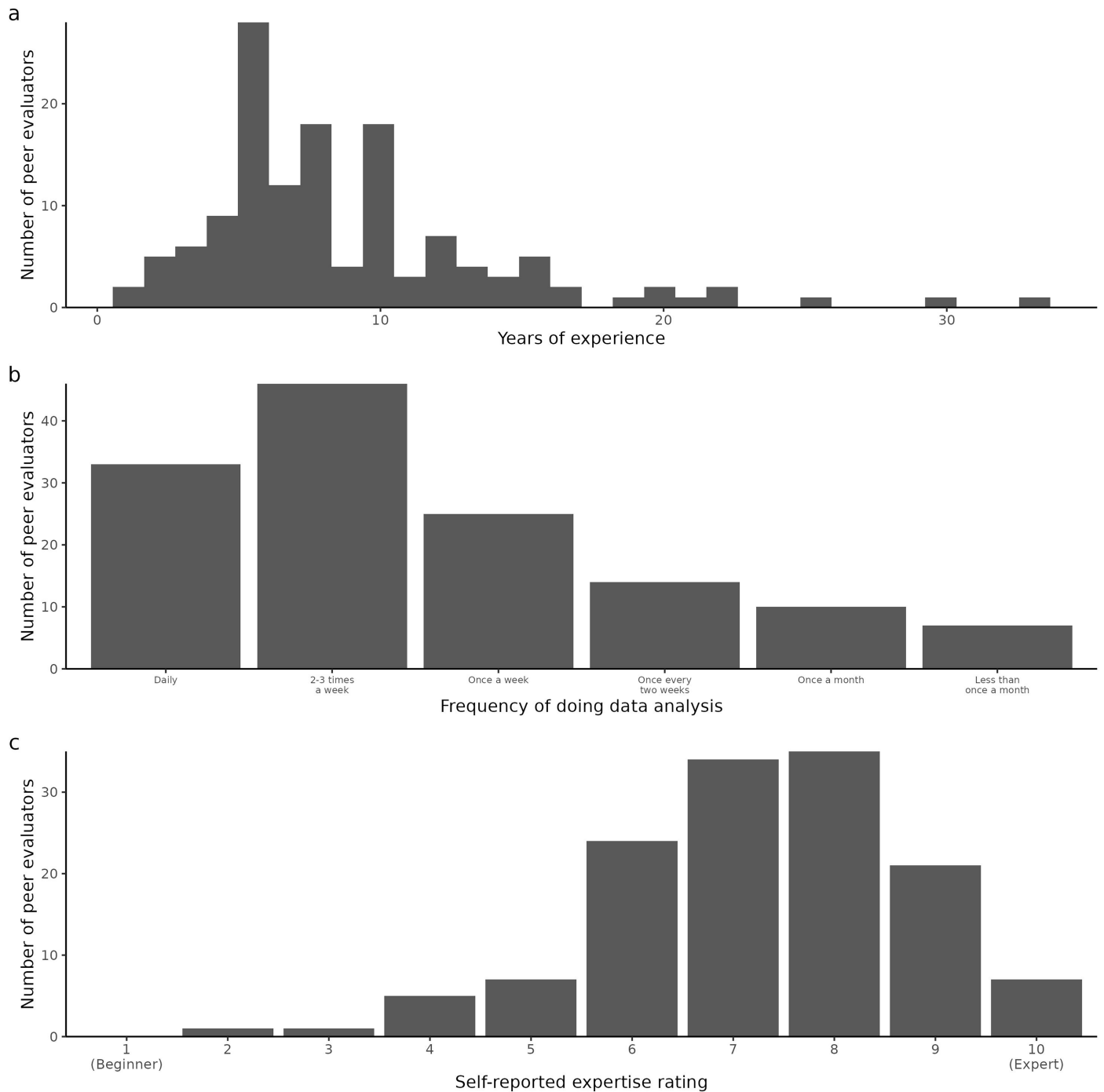
Reprints and permissions information is available at <http://www.nature.com/reprints>.



Extended Data Fig. 1 | Robustness of the statistical results. a, Robustness of the statistical results with different widths (\pm [0.01-0.20] Cohen's d) of the tolerance region. **b,** Robustness of the statistical results with different

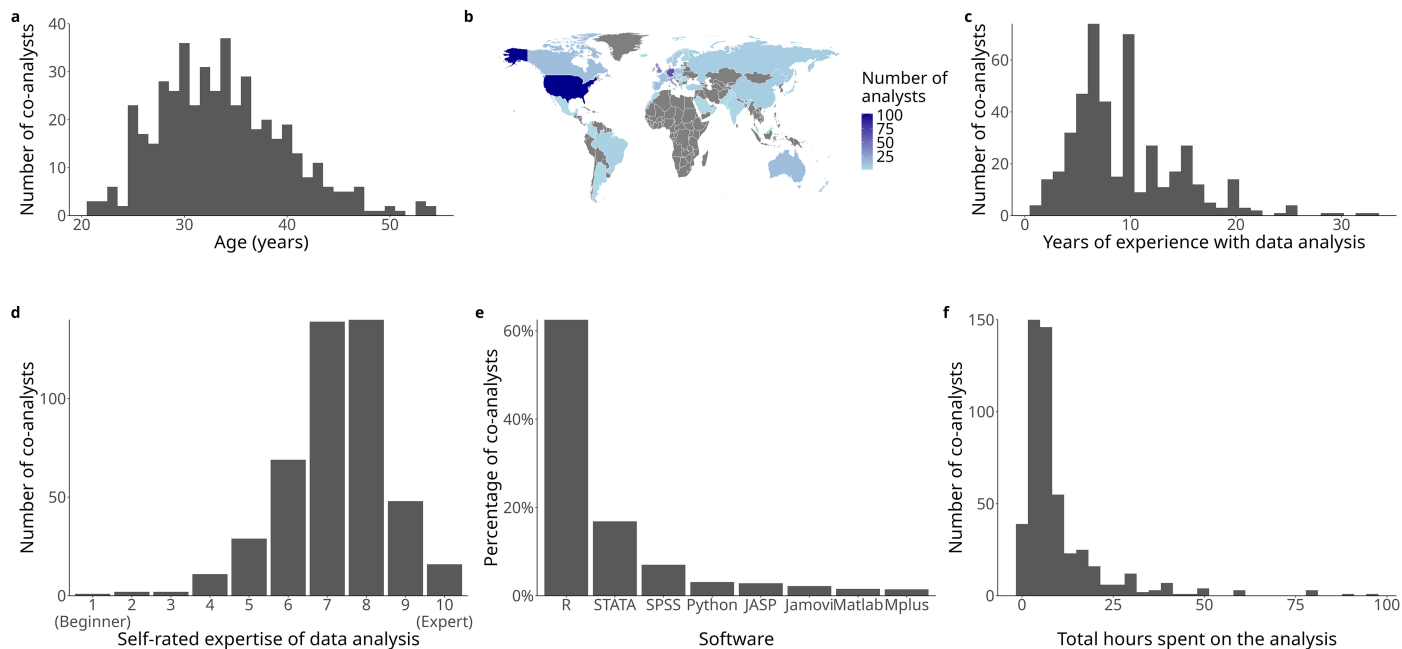
percentages (5-20%) of Cohen's d as a tolerance region. Calculations on the study and re-analysis levels are shown in different lines.

Article



Extended Data Fig. 2 | Descriptive statistics of the peer evaluators. **a**, The peer evaluators' years of experience with data analysis. When a peer evaluator submitted more than one evaluation and a year passed between the responses, we kept only their first response. **b**, The regularity with which peer evaluators

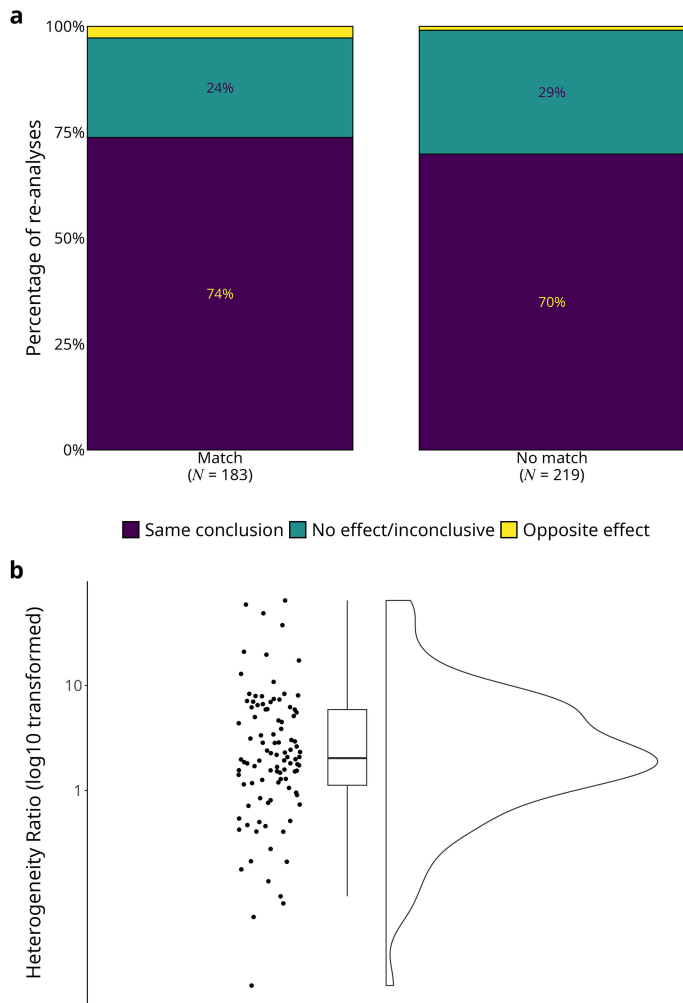
perform data analysis. **c**, The peer evaluators' self-rated level of expertise in data analysis. When a peer evaluator submitted more than one re-analysis, we kept only their first response.



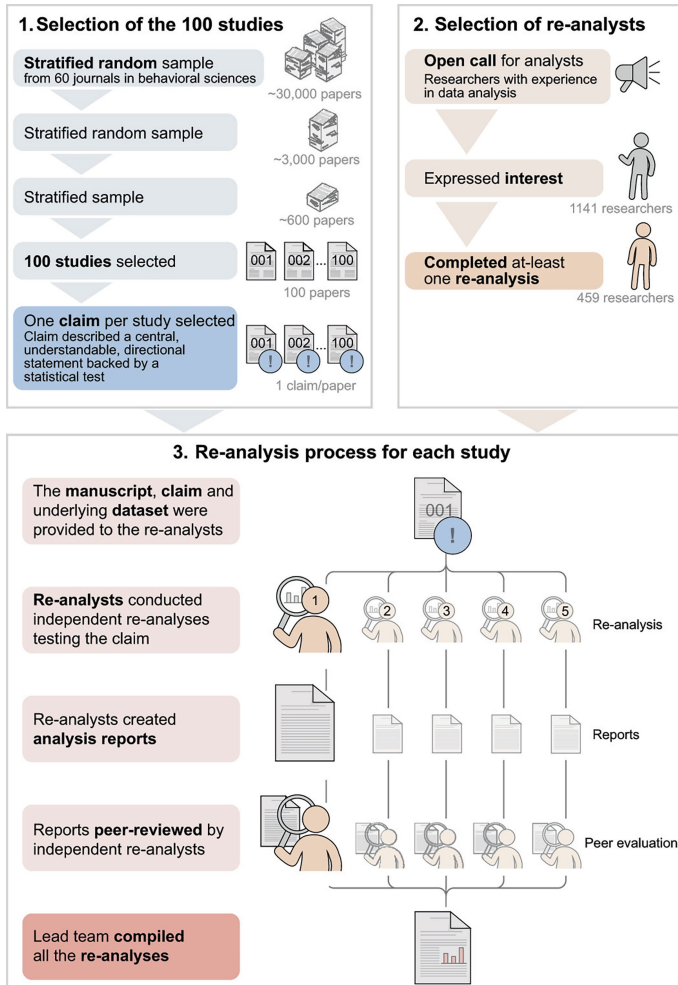
Extended Data Fig. 3 | Descriptive statistics of the analysts and the analyses. **a**, The distribution of the analysts' age. When an analyst submitted additional re-analyses with a higher reported age, we kept only their age at the time of their first submission. Moreover, one analyst is not represented in the figure because they did not disclose their age. **b**, The analysts' country of residence. When an analyst submitted more than one re-analysis, and they moved between the submissions, we only kept their first response. **c**, The analysts' years of experience with data analysis. We only kept their first response when an analyst submitted additional re-analyses with a higher reported age. **d**, The analysts' self-rated level of expertise in data analysis.

When an analyst submitted more than one re-analysis, we only kept their first response. **e**, The software the analysts used for their re-analysis tasks. In case an analyst completed multiple re-analyses or reported using multiple software applications, we kept all their responses for this figure. The figure displays only software applications used by more than 1% of the analysts. **f**, The reported total hours the analyst spent on Task 1 and Task 2 together. In case an analyst completed multiple re-analyses, we kept all their responses for this figure. One response was excluded due to being an outlier (999 h), which we assumed was an error.

Article



Extended Data Fig. 4 | Additional statistical results requested by the reviewers. a, Proportion of same effect, no effect/inconclusive results, and conclusions in the opposite direction of the original studies, by matches and nonmatches between the discipline of the re-analyst and the original study. **b**, The distribution of the heterogeneity ratios calculated between the effect size variability over the re-analyses and the sampling variability of the original study effect-size estimates.



Extended Data Fig. 5 | Overview of the project procedures. The figure depicts the procedural workflow of the selection of the studies (1); the selection of the re-analysts (2); and the re-analysis process for each study (3).

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

Data analysis

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](#)

Study data, and materials are available on the project OSF (<https://osf.io/q5h2c/>) and GitHub repositories (<https://github.com/marton-balazs-kovacs/multi100/>). Archived data include the original datasets or a description how to gain access to them. Our shared materials include all the survey questions, and the general communication texts and instructions that we sent to the re-analysts and peer-evaluators.

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	No human participants were involved in this study.
Reporting on race, ethnicity, or other socially relevant groupings	<i>Please specify the socially constructed or socially relevant categorization variable(s) used in your manuscript and explain why they were used. Please note that such variables should not be used as proxies for other socially constructed/relevant variables (for example, race or ethnicity should not be used as a proxy for socioeconomic status). Provide clear definitions of the relevant terms used, how they were provided (by the participants/respondents, the researchers, or third parties), and the method(s) used to classify people into the different categories (e.g. self-report, census or administrative data, social media data, etc.) Please provide details about how you controlled for confounding variables in your analyses.</i>
Population characteristics	<i>Describe the covariate-relevant population characteristics of the human research participants (e.g. age, genotypic information, past and current diagnosis and treatment categories). If you filled out the behavioural & social sciences study design questions and have nothing to add here, write "See above."</i>
Recruitment	<i>Describe how participants were recruited. Outline any potential self-selection bias or other biases that may be present and how these are likely to impact results.</i>
Ethics oversight	<i>Identify the organization(s) that approved the study protocol.</i>

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](https://www.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	In this exploratory study, we investigated the degree to which research findings in the social and behavioural sciences are contingent on analysts' choices. Therefore, we did not collect new data, but reanalysed already published datasets.
Research sample	The reanalyses have been conducted on the data of a sample of 100 studies published between 2009 and 2018 in criminology, demography, economics and finance, management, marketing and organisational behaviour, political science, psychology, and sociology. Therefore, our study did not involve collecting primary data.
Sampling strategy	The reanalysed studies have been selected by a previous project in which a stratified random sample of 600 articles was identified from a larger pool of randomly stratified ~30,000 articles from 62 journals, published between 2009 and 2019. In the present work, a further requirement of the selected studies was to contain a single inferential statistical test result that corresponded to the claim with our instructions. Thus, we ensured that given the claim and the instructions, no other statistical result could correspond to the claim in the original article. If all potential claims from the study were too ambiguous, and, therefore, could not be linked with a single inferential test statistic with the specification instructions, the study was excluded from our sample. The above-described study selection process has been continued until we reached 100 for our target number of studies, corresponding claims and datasets.
Data collection	The study did not involve any collection of primary data, other than the descriptives of the coauthor analysts.
Timing	<ul style="list-style-type: none"> ● Start of the project Feb 10, 2021 ● Recruitment of expert panel Feb 24, 2021 ● Start of re-analyst recruitment Jan 21, 2022 ● Start of re-analyses Nov 19, 2022 ● Completion of the empirical work Oct 22, 2024
Data exclusions	Out of the submitted analyses, one was omitted from the summary analysis as its analysis failed the peer evaluation, and an additional 4 analyses were excluded due to incomplete responses.
Non-participation	No participants were involved in the data analysis.
Randomization	<i>If participants were not allocated into experimental groups, state so OR describe how participants were allocated to groups, and if allocation was not random, describe how covariates were controlled.</i>

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

Methods

- | n/a | Involvement |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Antibodies |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Eukaryotic cell lines |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Palaeontology and archaeology |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Animals and other organisms |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Clinical data |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Dual use research of concern |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Plants |

- | n/a | Involvement |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> ChIP-seq |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Flow cytometry |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> MRI-based neuroimaging |

Plants

Seed stocks

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.

Novel plant genotypes

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.

Authentication

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.