Development of the Brief Open Research Survey (BORS) to measure awareness and uptake of Open Research practices

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Abstract

Objectives: Whilst the need for Open Research practices is well documented, there remains a lack of validated questionnaires to assess their prevalence. This study validated the Brief Open Research Survey (BORS) to measure Open Research awareness and uptake.

Methods: The survey was developed in six steps: 1) a scoping exercise collated previous questionnaires on Open Research, 2) a brief (<5 minutes) questionnaire was developed, 3) peer-reviewed, 4) piloted, 5) revised, and 6) the final questionnaire was distributed to researchers across universities in the UK Reproducibility Network.

Results: Respondents (*n* = 1,274) reported being most aware of Open Access Publications (94.1%), Preprints (85.3%), and Open Data (83.4%) and least aware of Registered Reports (38.1%), Study Preregistration (50.8%) and Research Co-production (53.7%). They reported having mostly used Open Access Publications (77.8%), Preprints (56.5%) and Open Data (52.5%) and having least used Registered Reports (8.7%), Replication Studies (16.3%), and Study Preregistration (25.3%). The most commonly reported areas of support required to enable Open Research were incentives (51%), dedicated funding (46.2%), and recognition in promotion and recruitment criteria (39.6%).

Conclusion: We developed the Brief Open Research Survey that can be used to assess prevalence of Open Research practices and track uptake of these overtime.

Background:

Open Research, also referred to as Open Science or Open Scholarship, are umbrella terms reflecting that knowledge should be open, transparent, rigorous, reproducible, replicable, cumulative, and inclusive (Parsons et al., 2022). It encompasses practices, or behaviours, that can be embedded across the entire research process from conceptualisation to dissemination for the purposes of improving research quality. For example, preregistration - the practice of making the plan for a study, including research questions/hypotheses, design, and the analysis strategy publicly available – aims to limit analytical flexibility (Simmons et al., 2021a; Thibault et al., 2023). Registered Reports allow provisional publication acceptance based on the quality of the study protocol, therefore shifting the focus to rigorous methodological design rather than the nature of results (Chambers & Tzavella, 2022). After data collection, making study materials, analytical code, software and data publicly available facilitates research transparency, replication, reproducibility and reuse (Fortunato & Galassi, 2021; Tenopir et al., 2020). At the point of dissemination, article preprint servers (e.g., PsyArXiv, medRxiv, SocArXiv, AfricArXiv; see Moshontz et al., 2021) allow readers early access to new research and authors to benefit from feedback or identifying errors through pre-publication peer-review (Watson, 2022) and, along with Open Access publishing (Basson et al., 2021), aid the accessibility of research. A glossary of concepts related to Open Research has recently been published to consolidate a shared terminology in this area and to reduce communication barriers (Parsons et al., 2022).

Open Research has been discussed increasingly over the past decade owing to concerns regarding the replication and reproducibility of research (see Pennington, 2023) and is essential for improving both research practice and wider culture across disciplines and career-levels (see Allen & Mehler, 2019; Edwards & Roy, 2017; Munafò et al., 2017; Munafò et al., 2022; Nosek et al., 2012 for overviews). However, the subsequent uptake of Open Research practices, and motivations for these, has not been systematically measured. There is currently a lack of validated questionnaires to objectively gauge awareness and uptake of Open Research that can be easily and quickly implemented (Galesic & Bosnjak, 2009) and that can allow the tracking of progression as research fields move forward. The current study therefore reports on the development and validation of an openly available and brief (<5 minutes) questionnaire that can measure awareness of and uptake of Open Research practices.

Initiatives to increase Open Research

Initiatives exist and have been recommended globally to increase the uptake of Open Research practices (G7 Open Science Working Group, 2021; NASA Science, 2022; UNESCO, 2021). Incentive initiatives include journal badges issued to papers with Preregistration, Open Data and Open Materials (Kidwell et al., 2016; Rochios & Richmond, 2022; Rowhani-Farid & Barnett, 2018), awards for Open Research practice (Merrett et al., 2021), and funder partnerships for Registered Reports (Chambers & Tzavella, 2022; Clark et al., 2021). Educational initiatives include embedding Open Research training into academic culture through workshops and conferences (e.g., the Society for Improving Psychological Science) and reforming undergraduate and postgraduate teaching (Azevedo et al., 2022; Egan et al., 2020; Student Initiative for Open Science, 2022; Pownall et al., 2021). Changes to hiring, progression, and promotion criteria are also changing to explicitly value Open Research practices, research quality over quantity, and 'slow science' (Bennett et al., 2023; Frith, 2020; Khan et al., 2022; Moher et al., 2018).

International guidance on best practices for Open Research have influenced national policies, such as the San Francisco Declaration of Research Assessment (DORA, 2022) and the European University Association Open Science Agenda 2025 (European Universities Association, 2022), as well as the Transparency and Openness Promotion (TOP) guidelines for journal procedures and policies to promote Open Research (Nosek et al., 2015). Large team science consortia are working to transparently and collaboratively deliver large-scale replication attempts globally (e.g., Klein et al., 2014; Klein et al., 2018; Open Science Collaboration, 2015) and address important and complex research questions (Button et al., 2020; Pennington et al., 2022).

Various networks have also been established, and resources developed, to support and promote Open Research practices (Armeni et al., 2021). Grassroots communities such as the ReproducibiliTea journal club (Orben, 2019) and RIOT Science Clubs (RIOT Science Club, 2022) convene to discuss key papers in the field of Open Research and meta-research with invited speakers, whilst discipline and sub-discipline-specific committees (e.g., European Health Psychology Society Open Science Special Interest Group; Toomey & Norris, 2020) aim to increase engagement with Open Research within defined research communities. International bodies such as the Center for Open Science (COS) provide free infrastructure for Open Research, such as the Open Science Framework (OSF; Foster & Deardorff, 2017), and a growing number of national-level networks seek to promote Open Research across disciplines, such as the UK Reproducibility Network (UKRN; www.ukrn.org) and its international partners (see Rahal et al., 2021;

Stewart et al., 2022; UK Reproducibility Network Steering Committee, 2021). The UKRN is a peer-led consortium that aims to ensure the UK remains a centre for world-leading research, connecting local researcher networks, university and research institute members with stakeholder organisations such as funders, publishers and policymakers (UK Reproducibility Network Steering Committee, 2021). In a recent paper, Korbmacher and colleagues (2023) therefore suggest that concerns about the replication and reproducibility of research has led to fast-paced and positive structural, procedural, and community reform.

Measures of Open Research

Antecedents to Open Research practices, including associated enablers and barriers, have been investigated with a view to maximising uptake (Osborne & Norris, 2022; Robson et al., 2021; Zečević et al., 2021). Meta-research has identified the extent to which researchers engage with Open Research across different disciplines by assessing journal policies, tracking open research practices within the published literature, or through surveys (Cashin et al., 2021; Ensinck & Lakens, 2023; Ferguson et al., 2023; Hardwicke et al., 2021; Norris et al., 2021, 2022; Wallach et al., 2018). Indeed, various various questionnaire measures have been developed to assess Open Research behaviours within countries (Baždarić et al., 2021; Pardo Martínez & Poveda, 2018), specific disciplines (Abele-Brehm et al., 2019; Bakker et al., 2022; Bowman et al., 2022; Houtkoop et al., 2018), institutions (e.g., University of Glasgow, 2021) or academic status groups (Toribio-Flórez et al., 2021). However, there is a lack of openly available, brief and, importantly, validated questionnaires to assess awareness, uptake, and support of Open Research practices that can be employed within and across institutions and countries. We therefore aimed to: i) develop a brief questionnaire that could be completed within approximately 5 minutes, and ii) administer this questionnaire across UK Reproducibility Network members to assess current awareness and uptake of Open Research practices in UK institutions.

Methods and Results:

We developed a twelve item Brief Open Research Survey (BORS; Supplementary File 2) that assesses awareness and uptake of 11 open research practices and perceived support to facilitate their use through the following six steps.

Step 1. Scoping exercise of previous questionnaires on Open Research

To inform the development of our questionnaire, we collated existing questionnaires that assessed Open Research practices by: i) reviewing surveys that were publicly available via the Open Science Framework search function; https://osf.io/ (performed in February 2021), ii) reviewing published literature on the prevalence of Open Research, and iii) engaging in personal correspondence with authors who we knew were developing questionnaires for their own institutions in the UKRN and beyond. This scoping exercise was not intended to be an exhaustive review of all existing questionnaires capturing Open Research practices but to provide insight into tools that could help ensure maximal breadth and depth of questions for our brief (<5 minutes) questionnaire.

Fifteen relevant existing questionnaires assessing Open Research practices were identified. Ten of these were institution-specific and five were being distributed within broader disciplines such as psychology (Abele-Brehm et al., 2019; Houtkoop et al., 2018; van den Akker et al., 2020) or geographical areas (Center for Open Science, 2022; Digital Science et al., 2019). Commonly explored areas within these questionnaires were awareness, attitudes, behaviours, and perceived barriers towards Open Research. The reported completion time for these surveys ranged from 5 minutes (e.g., Cardiff Open Science Internal Survey 2017; University of the West of England Open Science Internal Survey) to 20 minutes (Digital Science et al., 2019). Citations do not exist for all identified questionnaires, however, all previous relevant questionnaires have been made available via this study's OSF project page with consent from the questionnaire authors (https://osf.io/m6qxf/).

Step 2. Development of brief questionnaire

A brief (<5 minutes) questionnaire was developed after reviewing the existing questionnaires identified in Step 1 to assess: i) self-reported awareness and uptake of Open Research practices, ii) support that would facilitate the uptake of Open Research, and iii) demographics of respondents. Any disagreements

within the core research team (EN, KC, MM and CP) in the development of items were resolved through group meetings.

First, two questions assessed self-reported awareness and uptake of using eleven main Open Research practices: Open Research (as a general term), Study Preregistration, Registered Reports, Open Materials, Open Data, Open Code, Preprints, Open Peer Review, Open Access Publication, Replication Studies and Research Co-production. Each of these practices was accompanied by a brief definition. These practices were designed to capture the range of Open Research practices identified in Step 1, whilst also aiming for concision and brevity. Binary 'Yes' and 'No' response options were used for the awareness question ("I'm aware of this"). If respondents selected 'Yes' to the use question, they were then asked whether they had used this practice ("I've used this") with three options: 'I've used this', 'I haven't used this', and 'Not applicable to my research'.

Second, one item assessed what support respondents perceived to be required to facilitate their use of more Open Research practices ("What would help you to use more open research practices? Please select up to 5") with a total of 15 options. The options for this specific item were developed according to the Capability Opportunity and Motivation model of behaviour change (COM-B; Michie et al., 2011). In short, the COM-B model of behaviour (see Figure 1) posits three essential conditions as required to result in behaviour: 'capability' (including psychological and physical capability) in the individual's psychological and physical capacity to enact a behaviour, 'opportunity' (including social and physical opportunity) in the physical and social environment beyond the individual that facilitates a behaviour, and 'motivation' (including reflective and automatic motivation) to perform the behaviour (see Michie et al., 2011; Norris & O'Connor, 2019). Response options were structured according to the COM-B and included *'psychological capability'* (3 options): "More information on Open Research practices", "more training using Open Research practices" and "understanding ethical issues (e.g., issues around data sharing)"; *'physical opportunity'* (4 options): "Supporting infrastructure (e.g., sufficient storage for Open Data)", "More time", "Workload dedicated to Open Research" and "Dedicated funding for Open Research"; *'social opportunity'* (4 options): "Incentives from funders, institutions or other regulators", "Recognition of Open Research in promotion and recruitment criteria", "Support from senior researchers (e.g., supervisors and principal investigators)" and "Support from junior researchers (e.g., PhD students, early career researchers)"; and *'Reflective motivation'* (2 options): "Need for more positive beliefs about Open Research" and "I do not plan to take up Open Research practices". There

was also a "Nothing" and an "Additional" free-text response option. Respondents could select up to five options for this item.

Figure 1. The COM-B model of behaviour change.
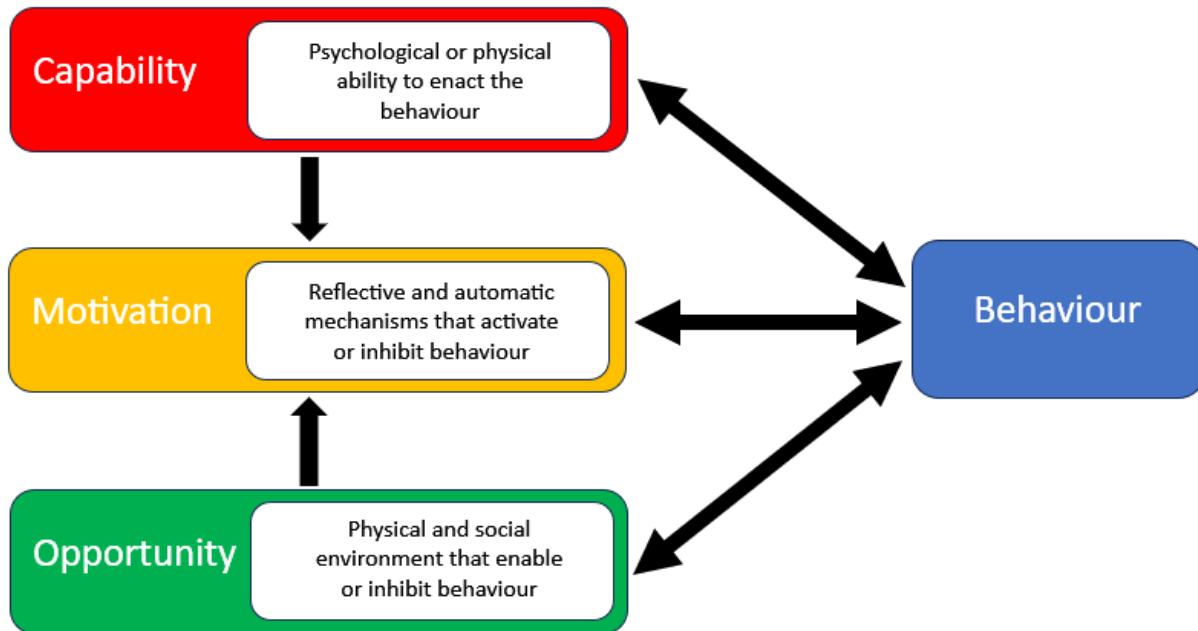
Third, six respondent demographic items were included to measure sample characteristics. This included College/Faculty/Division affiliations, academic discipline as assessed using HESA's Common Aggregation Hierarchy Level 1 (Higher Education Statistics Agency, 2022), research methods used (4 options): "Quantitative", "Qualitative", "Mixed" and "Other", career level (7 options): "Professor", "Reader", "Senior Lecturer", "Lecturer", "Senior Research Fellow", "Research Fellow", "Doctoral Researcher" (Doctoral Students) and "Other", whether the participant was a member of their university's Open Research Working Group: "Yes" or "No", and whether they were aware of the UK Reproducibility Network: "Yes" or "No". A final optional free-text question requested any additional comments.

Step 3. Peer-review of brief questionnaire

This draft questionnaire was appraised by members of the UKRN Steering Group, three UKRN Institutional Leads and three UKRN Local Network Leads via personal email invitations available on the UKRN website (https://www.ukrn.org/community/). Peer-reviewers were invited to identify any apparent issues and recommend changes via email, with no structured reply template provided. No

changes were suggested or made in this step. The original questionnaire used in the subsequent piloting stage is publicly available via https://osf.io/4q2fk/.

Step 4. Piloting of brief questionnaire

The questionnaire was piloted at Brunel University London, as it was a new Local Network member of UKRN, and its staff and doctoral students had not been previously surveyed on their Open Research practices. The online questionnaire was administered via Qualtrics and made available for 4 weeks from April to May 2021. The questionnaire was distributed to academic, research staff and doctoral students across all research disciplines via email and promoted through the Brunel Staff Intranet, Research Support & Development Office, Graduate School, weekly all-staff briefing webinars, and by senior staff and College research managers. Questionnaire results were discussed and recommendations established with consultation from the Brunel Open Research Working Group. Descriptive analyses were performed on the responses. Brief content analysis was performed on free-text responses provided, with comments provided verbatim.

Staff response rates were calculated from data in the university's staff Human Resources system, and Doctoral student response rates were calculated from data in the university's student records system. 235 responses were received in this pilot study. 82 (34.9%) of the 235 total responses were from Doctoral researchers, a response rate of 16% (82/514) of all Doctoral researchers at Brunel, 53 (22.6%) responses were from academic staff (Lecturers, Senior Lecturers, Readers or Professors): a response rate of 7.5% (53/706); 10 (4.3%) of responses were from research staff (Research Fellows or Senior Research Fellows): a response rate of 7.4% (10/135); and 4 (1.7%) were from 'Other' roles. Missing data on career level was evident in 36.6% (n=86/235) of total responses. Results are provided in Supplementary File 1; Tables 1-3. The dataset is provided at: https://osf.io/7ynxj/ and code is provided at: https://osf.io/5zqyf. The full report of this pilot data is provided on OSF: https://osf.io/453rd/.

Step 5. Revisions to questionnaire

The core research team (EN, KC, MM, CRP) identified aspects for improvement of the original questionnaire by reviewing: i) items receiving higher levels of missing data evident in the survey, ii) feedback provided within free-text comments in the survey, and iii) ensuring terminology, such as

career-level titles, were appropriate beyond the pilot university for additional UK institutions. Firstly, the order of questions was revised to include institutional demographic questions at the start and to ensure responses were traceable to specific institutions (i.e., to inform training initiatives within an institution, but to be redacted from publications to ensure anonymity and to mitigate a 'ranking' system being used for adopting open research practices). Second, some terminology was changed and expanded to ensure it was familiar to those in a UK context, with career titles revised from Doctoral Researcher to "PhD Student" and Lecturer to "Lecturer/Assistant Professor". Third, Brunel-specific questions were removed, including a question requesting examples of Open Research practice to gather Brunel University-specific case studies, and a question requesting affiliation to Brunel-specific Colleges. The final twelve item questionnaire was titled the Brief Open Research Survey (BORS) and was subsequently rolled out across UKRN institutions in Step 6. The full Brief Open Research Survey (BORS) distributed in this study is shown in Supplementary File 2 and is freely available online: https://osf.io/57gm2.

Step 6. Brief Open Research Survey (BORS) distributed across UK Reproducibility Network (UKRN) institutions

The Brief Open Research Survey (BORS) was administered via Qualtrics and made available for 18 weeks between September 2021 to January 2022. The questionnaire was distributed to UKRN Local Network institutions via their Local Network Leads who act as the institutional point of contact for UKRN and represent the grassroots network of researchers at that institution. Tips on how to promote the questionnaire were provided based on successful experiences in the piloting phase (Step 4), including seeking collaboration with Heads of Research, Faculty Managers, Heads of Department and University Internal Communications Team, as well as discussing the proposed dissemination plan within Open Research Working Groups. Local Network Leads were invited by the lead study authors to distribute the questionnaire at their institutions via email invites and Slack channels. Local Network Leads were advised that they would be provided with the data collected from their own institution after the study closed, providing them with an overview of awareness and use of open research practices within their own institutions. They were also invited to be co-authors on this paper based on their efforts with data collection and reviewing, editing and approving this final manuscript.

All academic staff, researchers and doctoral students were invited to respond, and they were informed that their responses would be anonymous. They were told that the study aim was to understand current

awareness and use of Open Research, and that the data would be used to inform development of future Open Research-related training and support at their institution and across the UK Reproducibility Network. The Brief Open Research Survey (BORS) with participant information and consent documentation is available here: https://osf.io/ztp5j. It was not possible to calculate response rates overall or within individual institutions due to the large scale of institutions involved. Pilot data collected in Step 4 was not included in this final sample.

Descriptive analyses were performed on responses at the overall sample level only. Institutional-level comparisons were not made to prevent judgements or 'rankings' individual institutions' Open Research initiatives. Percentages of Open Research awareness were calculated for the full sample, with no indication of awareness marked as 'I'm not aware of this'. Percentages for uptake were calculated only for participants deeming that the specific practice was applicable to their research. This latter step is in line with other research assessing reproducible research practices (e.g., Gopalakrishna et al. 2022) and was suggested by a peer-reviewer. As such, uptake of Open Research practices were calculated as: N indicating use of given Open Research practice / (N=1,274 (Overall sample) – N indicating Open Research practice Not Applicable to their research). Brief content analysis was performed on free-text responses by three members of the core research team (EN, KC and CRP) using comments in Microsoft Word. Respondents' quotes are reported verbatim below. The dataset is provided at: https://osf.io/dty5r/ and code is provided at: https://osf.io/z2jpw.

Response rate and demographics

Thirty-five out of sixty UKRN Local Networks (58.3%) provided data. 1,274 individuals responded in total, with institution sample sizes ranging from 1 to 198 (Figure 2). The average number of responses across institutions was 36.4. Respondent characteristics are outlined in Table 1.

Figure 2. Number of responses received by institution.
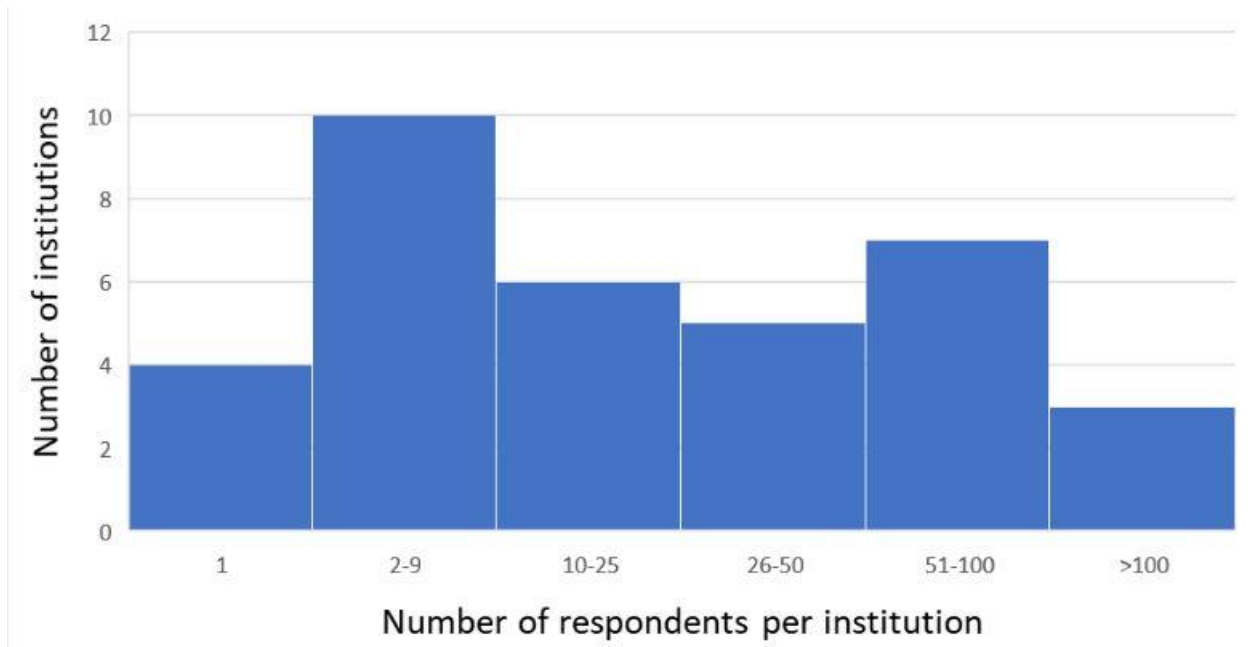
Table 1. Demographics of sample across UKRN institutions (*n*=1,274).

Research discipline*	n/%
Psychology	*n*=216 / 17%
Physical sciences	*n*=139 / 11%
Medicine & dentistry	*n*=126 / 9.9%
Subjects allied to medicine	*n*=123 / 9.7%
Biological and sport sciences	*n*=111 / 8.7%
Social sciences	*n*=87 / 6.8%
Engineering and technology	*n*=85 / 6.7%
Computing	*n*=54 / 4.2%
Mathematical sciences	*n*=44 / 3.5%
Veterinary sciences	*n*=43 / 3.4%
Geographical and environmental studies	*n*=30 / 2.4%

Education and teaching	*n*=22 / 1.7%
Agriculture, food and related studies	*n*=20 / 1.6%
Business and management	*n*=17 / 1.3%
General and others in sciences	*n*=17 / 1.3%
Humanities and liberal arts (non-specific)	*n*=15 / 1.2%
Creative arts and design	*n*=14 / 1.1%
Language and area studies	*n*=14 / 1.1%
Communications and media	*n*=8 / 0.6%
Historical, philosophical and religious studies	*n*=7 / 0.5%
Law	*n*=7 / 0.5%
Architecture, building and planning	*n*=6 / 0.5%
Combined and general studies	*n*=3 / 0.2%
No response	*n*=66 / 5.2%
Research methods experience	
Quantitative	*n*=544 / 43%
Mixed	*n*=417 / 33%
Qualitative	*n*=111 / 8.7%
Other	*n*=14 / 1.1%
No response	*n*=188 / 15%
Career Level	
PhD student	*n*=251 / 20%
Professor	*n*=236 / 19%
Senior Lecturer	*n*=167 / 13%
Research Fellow	*n*=153 / 12%
Lecturer / Assistant Professor	*n*=135 / 11%
Reader	*n*=81 / 6.4%

Senior Research Fellow	*n*=69 / 5.4%
Other	*n*=92 / 7.2%
No response	*n*=90 / 7.1%
Member of a Research Group	*n*=956 / 75%
Current member of institution's Open Research Working Group	*n*=112 / 8.8%
Interested in being involved in Open Research initiatives at institution	*n*=696 / 55%
Aware of the UK Reproducibility Network (UKRN)	*n*=462 / 36%

Note: *Data collected and presented using HESA's Common Aggregation Hierarchy
https://www.hesa.ac.uk/support/documentation/hecos/cah-list.

Awareness and Uptake of Open Research practices

Of the 1,274 respondents, most were aware of Open Access Publications (94.1%; *n*=1,199), Preprints (85.3%; *n*=1,087), Open Data (83.4%; *n*=1,063), Open Peer Review (71.4%; *n*=910), Open Code (69.2%; *n*=881), Open Research (68.7%; *n*=875), Replication Studies (67.7%; *n*=863) and Open Materials (66.1%; *n*=842; see Figure 3). Respondents were least aware of Registered Reports (38.1%; *n*=485), Study Preregistration (50.8%; *n*=647), and Research Co-Production (53.7%; *n*=684). Respondents reported having most used Open Access Publications (77.8%; *n*=975/1,253 deeming as applicable to their research), Preprints (56.5%; *n*=709/1,255) and Open Data (52.5%; *n*=633/1,206), and having least used Registered Reports (8.7%; *n*=106/1,221), Replication Studies (16.3%; *n*=190/1,165), and Study Preregistration (25.3%; *n*=299/1,184).

Figure 3. Open Research awareness and uptake across UKRN institutions (*n*=1,274) assessed using the Brief Open Research Survey (BORS).
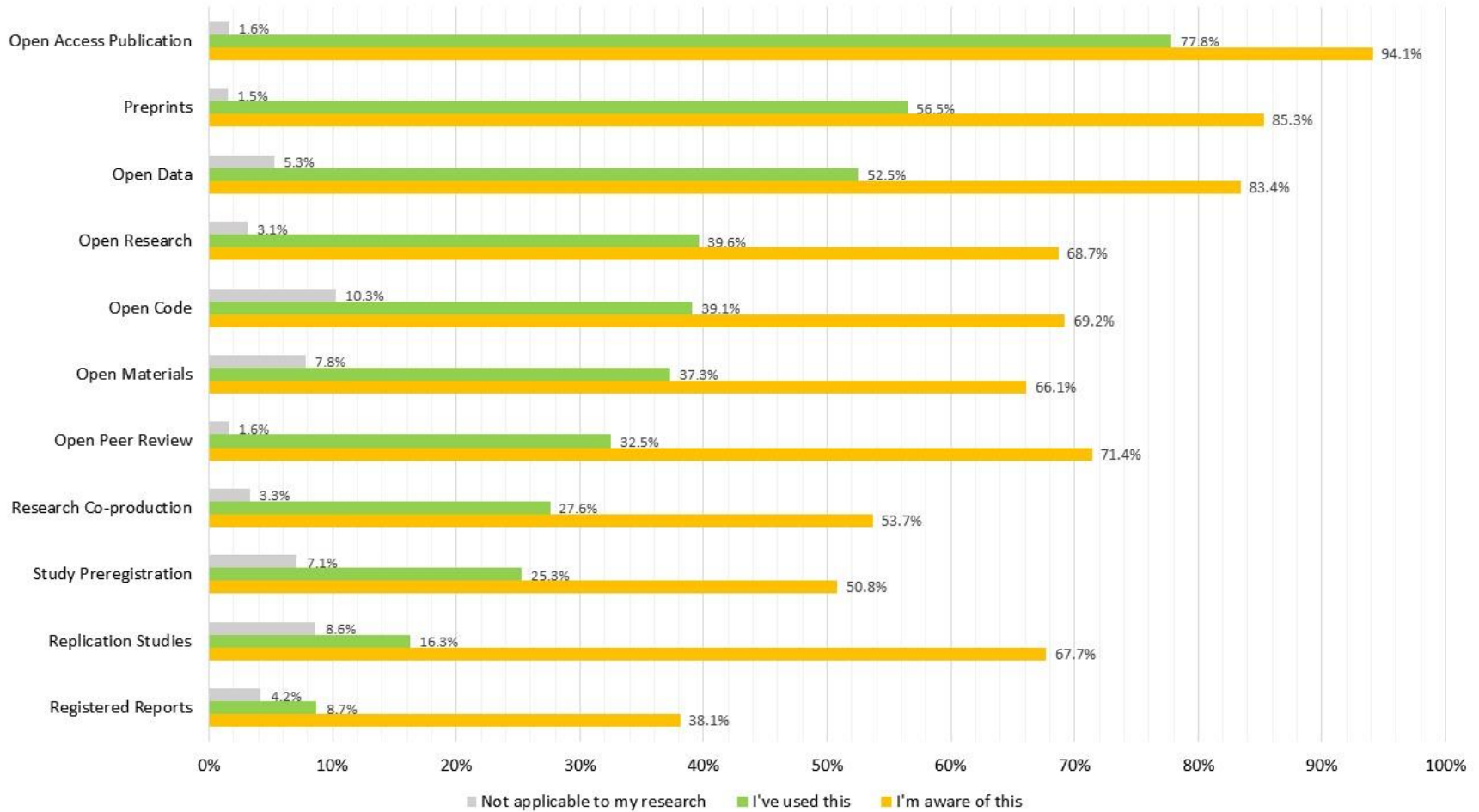
Note: Percentages for the uptake of Open Research practices were calculated only for participants deeming that the specific practice was applicable to their research.

Support required to increase Open Research practices

The most commonly reported areas of support required to enable Open Research were "Incentives from funders, institutions or other regulators" (51%), "dedicated funding for Open Research" (46.2%), "recognition of Open Research in promotion and recruitment criteria" (39.6%), "more training using Open Research practices" (38%) and "more information on Open Research practices" (37.3%; see Table 2). A total of 2.6% respondents reported that no strategies were needed to increase Open Research and 1.5% reported not planning to take up Open Research practices.

Additional (optional) free-text comments were provided by 6.8% of respondents to extend what strategies would support the use of more Open Research practices. These comments were mapped to the strategies outlined above (see Table 3), with nine of the fourteen support strategies provided being supported by free-text comments. "Workload dedicated to Open Research", "Need for more positive beliefs about Open Research", "Support from junior researchers (e.g., PhD students, early career researchers)" were not identified as themes supported by free-text comments. Five additional themes were also identified from these free-text comments. All anonymised free-text responses are available in the dataset on OSF: https://osf.io/dty5r.

Table 2. Recommended strategies to increase Open Research practices across UKRN institutions (*n*=1,274), assessed using the Brief Open Research Survey (BORS).

Strategy to increase Open Research	COM-B component	n/%
Incentives from funders, institutions or other regulators	Social opportunity	*n*=650 / 51%
Dedicated funding for Open Research	Physical opportunity	*n*=589 / 46.2%
Recognition of Open Research in promotion and recruitment criteria	Social opportunity	*n*=504 / 39.6%
More training using Open Research practices	Psychological capability	*n*=484 / 38%
More information on Open Research practices	Psychological capability	*n*=475 / 37.3%
More time	Physical opportunity	*n*=421 / 33%
Support from senior researchers (e.g., supervisors and principal investigators)	Social opportunity	*n*=369 / 29%

Supporting infrastructure (e.g., sufficient storage for Open Data)	Physical opportunity	*n*=365 / 28.6%
Workload dedicated to Open Research	Physical opportunity	*n*=349 / 27.4%
Understanding ethical issues (e.g., issues around data sharing)	Psychological capability	*n*=333 / 26.1%
Need for more positive beliefs about Open Research	Reflective motivation	*n*=147 / 11.5%
Support from junior researchers (e.g., PhD students, early career researchers)	Social opportunity	*n*=68 / 5.3%
I do not plan to take up Open Research practices	Reflective motivation	*n*=19 / 1.5%
Nothing		*n*=33 / 2.6%
Additional strategies suggested		*n*=87 / 6.8%

Note: Respondents were asked to select up to 5 options.

Table 3. Themes with example quotes from free-text responses received within the Brief Open Research Survey (BORS) across UKRN institutions

Theme 1: Support for "Incentives from funders, institutions or other regulators"		
"More incentives from my institution leadership to practice open science. I feel they do not recognise the relevance of open science"	*"I'm not sure it's incentives that are needed (i.e. funds), but if there is to be uptake then Open Research needs to be part of the evaluation criteria of the funder"*	

Theme 2: Support for "Dedicated funding for Open Research"		
"Money to pay for open access publications! I am all for open access, and it increases citations, which is a bonus but it's SO EXPENSIVE!"	*"[my institution] does have funding for publishing open access articles but the budget is too low"*	*"Institutional support for open access fees where funder is too small to cover this themselves"*.

Theme 3: Support for "Recognition of Open Research in promotion and recruitment criteria"	
"Institutional changes (both intra-university and inter-university), such as more responsible use of metrics and organisational structure that leads to actively promoting the uptake of open science practices"	*"rewards for career"*

Theme 4: Support for *"*More training using Open Research practices"		
"talks I find online expect some knowledge, but also aren't 'training' Make it feel less intimidating - seeing people online be critical of those who make mistakes makes me nervous of trying"	*"Better resources/guidance on accessing data and code etc - currently the location of this material is very disparate"*	*"More training, guidance, or protection against some of the real and perceived risks of open research, e.g., stealing of ideas, public embarrassment, use of data without credit, public or media misuse of preprint info etc"*

Theme 5: Support for "More information on Open Research practices"		
"how to apply these practices in Open an(d)* Social Science setting"*	*"Clear rules surrounding the release of medical datasets / machine learning models."*	*"more subtlety and understanding of the issues and meanings of terms (beyond just ethical issues) would be helpful"*

Theme 6: More time

"Problem is time not whether I think this is a good idea"	*"supporting proper open access code/data requires time!"*	*"I would be interested if I was on a long-term contract and had the time for no-project-specific work"*
Theme 7: Support for "Support from senior researchers (e.g., supervisors and principal investigators)"		
"Ensuring Vice Chancellors support and agree that OS and OA are important and mission critical. Moving the dial on institutional change has to be led from the top and is still considered a side issue for very senior leadership"		*"Initiative by the leading research figures in my field"*
Theme 8: Support for "Supporting infrastructure (e.g., sufficient storage for Open Data)"		
"Administrative support/IT support to put things in the correct format, add meta data, etc"	*"More effective data management systems within host organisation. More effective tools for on-line collaboration on projects"*	*"the biggest challenge here is making data publicly available over a long period, when the funding to maintain the datastore runs out"*
Theme 9: Support for "Understanding ethical issues (e.g., issues around data sharing)"		
"More recognition about qualitative research - which cannot always be open without putting the identity of participants at risk"	*"Understanding around legal and information governance issues (beyond ethics)"*	*"Ethics committee understanding the benefits and making it simpler to share data (currently we have to jump through extra hoops to share research data online)"*
Theme 10: Need for increased acceptance of Open Research by journals		
"Change of attitude from publishers. There are still many journals which do not accept submissions that have been shared as preprints"	*"Journals need to take OS more seriously - especially replication"*	*"complete overhaul of academic journal publication system! towards a more open approach to reporting academic research conduct and results"*
Theme 11: Need for reduced number of Open Research platforms	**Theme 12: Consequences for those not doing or supporting Open Research**	**Theme 13: Lack of personal benefits**

"Platform reduction - currently there is a trend for even more platforms, most of which have only a modicum of distinctiveness"	"Sticks for those that continue to publish in a non-open manner. Senior (Prof level) staff continue to be able to just get away with it, and seem to be a barrier to culture change"	"The effort is very worth it for the subject, but hardly ever for the researcher who just gets additional work" "there is no real benefit to the individual researcher in putting in extra work to ensure their work is 'open'"
Theme 14: Querying usefulness of Open Research		
"Why the hassle?" "Open research is a waste of time distracting us from more important issues. May be important in medicine but in other disciplines it is holding us back"	"What is the obsessions psychologists have with reproducibility?! Best advice is just to stop doing all their research on students..."	"Much of these seems so specific to quantitative research - I share pre pubs and so on, but in my view qualitative research and data are not suited to aspects of Open Research in various ways."
"Much of these seems so specific to quantitative research - I share pre pubs and so on, but in my view qualitative research and data are not suited to aspects of Open Research in various ways."	"There is an assumption in this survey that all of the open research practices are good and the questions are heavily leading in that direction!"	

Many of these responses supported or gave elaborations on the items provided within the Brief Open Research Survey (BORS). The most popular strategy "Incentives from funders, institutions or other regulators" (Theme 1; Table 3) was supported by various quotes, highlighting a lack of incentives by institutions and funders to reward Open Research practices. The second most popular strategy of "Dedicated funding for Open Research" (Theme 2) was supported by many quotes focused on the high costs of Open Access Publishing, alongside a lack of institutional financial support for gold Open Access Publishing. The strategy of "Recognition of Open Research in promotion and recruitment criteria" (Theme 3) was extended by comments to include a need for career recognition beyond institutional initiatives alone. The strategy of "More training using Open Research practices" (Theme 4) was supported by comments reflecting a need for easily accessible training aimed at non-experts, a need for unification of resources, and training specifically aimed at negating potential risks of Open Research. The strategy of "More information on Open Research practices" (Theme 5) was extended by comments to require a focus on application to different disciplines and specific data types. The strategy of "More time" (Theme 6) was supported by comments highlighting competing demands on research time

restricting capacity for Open Research, and short-term job contracts restricting ability to work in a more Open and rigorous manner. "Support from senior researchers (e.g., supervisors and principal investigators)" (Theme 7) was extended by comments to include role modeling by senior institutional figures and disciplinary leaders. The strategy of "Supporting infrastructure (e.g., sufficient storage for Open Data)" (Theme 8) was extended to include specific required resources, including personnel and software. Finally, the strategy of "Understanding ethical issues (e.g., issues around data sharing)" (Theme 9) was extended to highlight an emphasis on qualitative research, a need for broader support beyond ethics alone, and a need for upskilling in staff assessing ethical applications.

Additional strategies to increase uptake of Open Research were also provided in free-text comments. A need for increased acceptance of Open Research by journals was suggested (Theme 10), reflecting a need for more positive attitudes and evident behaviours by journals and publishers to support Open Research, with more zealous comments calling for a global overhaul of academic publishing. Some comments called for a reduced number of Open Research platforms (Theme 11). Other themes reflected consequences for those not doing Open Research (Theme 12), a lack of personal benefits (Theme 13), as well as queries with regards to the usefulness of Open Research (Theme 14).

Discussion:

Owing to concerns regarding the replicability and reproducibility of research, Open Research practices have been developed and increasingly discussed over the past decade. These are viewed as imperative for improving both research practice and wider culture and to ensure long-term sustained behaviour change. Whilst the need for Open Research practices is now well documented, there remains a lack of validated questionnaires to assess their prevalence amongst researchers. We therefore developed and validated the Brief Open Research Survey (BORS) to measure awareness and uptake of Open Research practices and support required for performing these practices.

In a sample of 1,274 respondents based at Higher Education institutions in the United Kingdom spanning multiple career stages and research disciplines, we show that most respondents were aware of Open Access Publications (94.1%), Preprints (85.3%) and Open Data (83.4%) and least aware of Registered Reports (38.1%), Study Preregistration (50.8%), and Research Co-Production (53.7%). Respondents reported a similar pattern for usage, having most used Open Access Publications (77.8%), Preprints

(56.5%) and Open Data (52.5%) and having least used Registered Reports (8.7%) and Replication studies (16.3%), and Study Preregistration (25.3%). These data can be used to tailor education training initiatives to support wider uptake and engagement with Open Research practices and to track the trajectory of such behaviours longitudinally over time. This survey has been made openly available to enable reuse by other researchers and groups (e.g., research institutes, funders) and, due to its brief nature, can be incorporated alongside other measures in meta-research (e.g., perceptions of enablers and barriers of Open Research practices or individual difference measures that may identify predictors of increased usage).

Support required to increase Open Research practices

usage).

Support required to increase Open Research practices

As well as gauging awareness and use of Open Research practices, our survey also assessed strategies that were perceived as supporting their implementation. Respondents most commonly reported that incentives from funders, institutions or other regulators (51%: social opportunity), dedicated funding for Open Research (46.2%: physical opportunity), Recognition of Open Research in promotion and recruitment criteria (39.6%: social opportunity), more training using Open Research practices (38%: psychological capability) and more information on Open Research practices (37.3%: psychological capability) would be most helpful for supporting usage of Open Research. These mainly map onto the facets of social opportunity, physical opportunity, and psychological capability from the COM-B model of behaviour change (Michie et al., 2011). Social opportunity, which includes support from social structures and colleagues to engage with Open Research in the context of this study, was the first and third most requested behaviour change component. The need for such support from wider social structures to facilitate Open Research has been previously discussed in meta-research on preregistration (Osborne & Norris, 2022) and Registered Reports (Chambers & Tzavella, 2022), and is supported by Early Career Researchers (Kowalczyk et al., 2022; Zečević et al., 2021) and Open Research networks (Stewart et al., 2022). Whilst there has been promising progress to incentivise, recognise and reward Open Research practices, including within journals (e.g., via badges; Kidwell et al., 2016) and across them (e.g., via TOP factor assessment; Nosek et al., 2015), by funders (e.g., Registered Reports funding partnerships; Clark et al., 2021; Drax et al., 2021), and some institutions (e.g., European Universities Association, 2022), this

remains quite limited. More work is therefore needed to ensure a unified, coordinated response from research stakeholders and institutions to facilitate and reward Open Research to change the academic incentive culture and create new norms (Stewart et al., 2022). For example, a recent assessment of 305 job advertisements from 91 global institutions identified that only 0.6% explicitly mentioned Open Research across career levels (Khan et al., 2022). Recruitment of specific professional team infrastructure roles to support rigorous research, such as data stewards, project managers and community managers, would further facilitate capacity for Open Research support (Bennett et al., 2023).

Physical opportunity, in having the time and resources to engage with Open Research, was the second most requested behaviour change component suggested by respondents. Calls for funding schemes to examine and increase Open Research within disciplines have been prominently recommended (Morillo, 2020; Severin & Egger, 2021), with an increasing number of funding calls being established to facilitate this (Dutch Research Council, 2021; Wellcome, 2021). Funding would therefore facilitate the use of Open Research practices by providing researchers with the time and resources needed to engage in 'slower science' (see Frith, 2020), whilst simultaneously providing a route for social opportunity. Nevertheless, it is important to note that such funding support will only provide physical opportunity for applicants who are successful. Short-term contracts, highly prevalent at pre- and post-doctoral career levels, by their nature, implicitly emphasise a need for quick research over high quality, transparent, and slower research (Allen & Mehler, 2019). An 'invisible workload' of Open Research for researchers is prevalent (Hostler, 2023), whereby academics already working in an arguably stressful and hyper-competitive system may perceive further workload burden with Open Research practices, and their adoption may also fall to Early Career Researchers who already face cultural inequalities. Wider culture change is thus required to adopt and recognise this need for slow science to enable high-quality, transparent, rigorous, robust, replicable and reproducible research. Evaluations of Open Research should be embedded in national research frameworks and institutional research agendas, and there are a few recent notable efforts in this area, such as the European University Association Open Science Agenda 2025 (European Universities Association, 2022; see also Stewart et al., 2022).

Psychological capability, in having insufficient knowledge and skills to engage with Open Research, was the fourth and fifth selected behaviour change component by respondents. Open Research training and associated resources to facilitate psychological capability are being developed by numerous organisations, such as the Framework for Open & Reproducible Research Training (FORRT; e.g., Azevedo

et al., 2022; Pownall et al., 2021), the UK Reproducibility Network (UKRN; Towse et al., 2020) and beyond (Egan et al., 2020). Open Research training is also evident in some UKRN institutions (University of Reading, 2022; University of Surrey, 2022), largely tailored to their own institutional staff and students. There have also been calls for greater recognition of Open Research teaching within higher education, for undergraduate and postgraduate students who represent the future of our research disciplines (see Pennington, 2023; Pownall et al., 2023). Further support is needed to bolster completion of existing training, as well as a need to fill gaps in training provision. It is also evident from our data that such training is wanted, and it would be fruitful to explore any potential barriers to this in future work (i.e., whether there is a problem with uptake of training due to time constraints/pressures on researchers or a lack of training opportunities being provided by institutions and research organisations). For example, the need for increased accessibility of Open Research training and support from feminist and intersectional perspectives has been highlighted (Pownall, Talbot, et al., 2021; Sabik et al., 2021; Whitaker & Guest, 2020), as well as the need for increased relevance beyond quantitative methods to qualitative and mixed methods research (Branney et al., 2019; Branney et al., 2023; Humphreys et al., 2021), which was also reflected in some of our respondents open-ended comments.

Strengths and Limitations

Strengths of this study include the distribution and completion of this questionnaire across a wide range of UK Higher Education institutions, career levels and research disciplines, ensuring relevance across researchers, research domains and methodologies. Furthermore, the strengths of the Brief Open Research Survey (BORS) itself include its brevity and its provision of individual institution-level data on Open Research awareness, uptake and support. Within this UK and UKRN context, Local Network Leads who facilitated the distribution of the BORS now have evidence-based institutional data that gives an indication of current Open Research practices within a subsample of researchers in their institutions and can be used to tailor educational and training initiatives. The BORS is openly available and can be used to measure awareness and uptake of Open Research practices at a particular time point, or longitudinally to track the trajectory of these practices over time. Indeed, the BORS is currently being rolled out internationally to provide wider estimates of Open Research awareness and uptake (Pennington et al., 2024). Here, the BORS has been adapted with minor modifications, such as translation and terminology changes, whilst maintaining its overall structure. The findings of this project will inform future education and training initiatives on Open Research.

A limitation of this study, however, is that the sample is arguably self-selected. The survey was distributed to researchers across universities in the UK Reproducibility Network and respondents were therefore part of institutions that have already made some commitment to Open Research by having these grassroots roles in place. Although the survey was disseminated to all academic staff, researchers, and PhD students within these institutions, respondents may have also been more likely to respond if they were already aware and using Open Research practices, whereas those who oppose them may have been less likely to take part. This is reflected in our data with only 1.5% of respondents suggesting that they do not plan to take up Open Research practices. Some respondents may not consider some or all Open Research practices to be relevant to their research discipline, such as Registered Reports in the Arts for example, and this will influence the prevalence of awareness and engagement with these practices.

This limitation is applicable to all Open Research surveys and could be overcome by embedding questions relating to Open Research within more general research surveys. It may therefore be likely that awareness and uptake of Open Research practices has been overestimated in this study due to such response bias. In addition, only a small number of respondents (6.8%) provided additional free-text responses to inform the themes identified, and it was not possible to calculate the response rate for the full UKRN sample, due to the large scale of institutions involved. There was also a large range in the response rates across institutions, with four institutions having only one response and ten institutions having under 10 responses. Ineffective channels being used to disseminate the survey by Local Network Leads is a likely driver of low response rates in these institutions. Greater guidance for dissemination could be supplied to participating institutions in future iterations of BORS and other Open Research surveys with additional reminders and/or incentives to participate.

Nevertheless, even in this 'self-selecting' sample, we still show the need for greater awareness and uptake of Open Research practices, particularly for practices such as Registered Reports and Study Preregistration which can mitigate researcher degrees of freedom and bias within the literature (see Chambers & Tzavella, 2022; Simmons et al., 2021b; Thibault et al., 2023). Indeed, not all Open Research practices will be appropriate or even possible for all research studies, but awareness of them is key to ensure that researchers can make such an informed choice about their usage.

Changes made to the BORS following peer review

The peer reviewers of this manuscript made some helpful recommendations for improving the survey, which we have implemented within a second version that can be used in future research (https://osf.io/2s8f3). These recommendations and changes are as follows:

1. The term 'Use' within Q4b on Open Research practices is ambiguous because it could relate to use of the practice by the respondent themselves in their own research process, or the respondent's use of a practice as performed by others. For example, a respondent could identify that they have 'used' Registered Reports by either publishing their own, or by reading and interpreting the Registered Report of someone else. To address this, we have changed the response options for Q4b to be "Accessing/using only; Practicing myself; Not applicable to my research". We have also included guidance for Q4b on how to respond to each of these response options (following the guidance provided in Ihle et al. 2021). To ensure awareness and usage of Open Research practices are respectively captured, we have maintained Q4a to ask respondents to indicate their awareness, and maintained the survey logic that only practices checked as 'I am aware of this' show up in Q4b for judgements of access, use and practice.

2. The guidance on how to respond to Q4b on 'use' of Open Research practices advised respondents to 'Tick all that apply', which was ambiguous. As such, we have revised the guidance to 'Tick all of the Open Research practices to which this applies'. We have also made this clearer in Q4b: "*only practices selected with 'I am aware of this' in Q4a are presented here*"

3. The definition of 'Open Code' within Q4a/b has been refined to reflect the lawful use of licenced software as "code which is openly licensed and available for scrutiny, adaptation and reuse" (UKRN, 2022; https://osf.io/preprints/osf/qw9ck).

4. The various ways academic job titles are represented in different universities are not fully represented. Between this first use of BORS and peer-review, we had already changed this terminology within an international version of the survey: (https://osf.io/y5z2d). To reflect a more broader range of academic job titles and align BORS with the international version of the survey, we adjusted wording to 'Associate Professor/Reader' and 'Assistant Professor/Senior Lecturer', as well as 'Non-permanent Research-Only position / Postdoctoral Researchers / Research Associate/Fellow' and 'Permanent Research-Only Position'.

5. 'More time' within Q5 is ambiguous because it could be seen to represent a need for more preserved research time for existing academic contracts or a need for longer temporary research contracts to facilitate Open Research. To remove this ambiguity, we replaced 'More time' with two distinguishable items: 'Allocating more time in academic contracts to Open Research practices', and 'Longer research contracts for temporary research staff'.

Conclusion:

We developed and validated the Brief Open Research Survey (BORS) to measure Open Research awareness, uptake and support. We developed the questionnaire iteratively through a scoping review of previous related questionnaires, peer-review and piloting at one university, before rolling it out to UKRN institutions (k=35 institutions, n=1,274 respondents). Respondents reported being most aware of Open Access Publications (94.1%), Preprints (85.35), and Open Data (83.4%) and least aware of Registered Reports (38.1%), Study Preregistration (50.8%) and Research Co-production (53.7%). They reported having mostly used Open Access Publications (77.8%), Preprints (56.5%) and Open Data (52.5%) and having least used Registered Reports (8.7%), Replication Studies (16.3%), and Study Preregistration (25.3%). Underpinned by the COM-B model of behaviour change, we found that social opportunity (i.e., incentives from funders, institutions or other regulators), physical opportunity (i.e., dedicated funding for Open Research) and psychological capability (i.e., more information and training using Open Research practices) were perceived as supportive strategies that would most help researchers to use more Open Research practices. The BORS can be used to collect longitudinal data to examine the trajectory of Open Research uptake over time and is already being used in an ongoing study to assess estimates of Open Research awareness and engagement internationally. We welcome community feedback on the BORS which can be implemented in future updates and uses of this resource.

Ethical approval

Ethical approval was obtained from Brunel University London (30088-A-Aug/2021- 33869-1).

Data accessibility

All materials and data are available via the project's Open Science Framework page: https://osf.io/3v2ps/. Materials (https://osf.io/m6qxf/); Pilot data (https://osf.io/7ynxj) and code

(https://osf.io/5zqyf) from Brunel University London; Full study data (https://osf.io/dty5r) and code from UKRN sample (https://osf.io/z2jpw).

CrediT author statement:

E.N.: Conceptualisation, data curation, formal analysis, investigation, data collection, methodology, project administration, resources, software, supervision, validation, visualisation, writing – original draft, writing – review & editing; K.C.: Conceptualisation, formal analysis, investigation, data collection, methodology, project administration, resources, software, supervision, validation, writing – original draft, writing – review & editing; M.M.: Conceptualisation, investigation, methodology, project administration, supervision, writing – review & editing; C.J.: Data collection, writing – review & editing; J.R.B.: Data collection, writing – review & editing; A.L.: Data collection, writing – review & editing; H.P.: Data collection, writing – review & editing; M.P.: Data collection, writing – review & editing; E.M.R.: Data collection, writing – review & editing; C.C.B.: Data collection, writing – review & editing; W.C.: Data collection, writing – review & editing; N.B.: Data collection, writing – review & editing; S.G.: Data collection, writing – review & editing; S.E.: Data collection, writing – review & editing; S.R.: Data collection, writing – review & editing; M.S.: Data collection, writing – review & editing; E.W.: Data collection, writing – review & editing; M.K.: Data collection, writing – review & editing; N.S.: Data collection, writing – review & editing; A.J.: Data collection, writing – review & editing; R.C.: Data collection, writing – review & editing; D.S.: Data collection, writing – review & editing; L.W.: Data collection, writing – review & editing; E.S.P.: Data collection, writing – review & editing; A.M.P.: Data collection, writing – review & editing; C.H.: Data collection, writing – review & editing; A.S.: Data collection, writing – review & editing; C.R.P.: Conceptualisation, formal analysis, investigation, data collection, methodology, project administration, resources, software, supervision, validation, visualisation, writing – original draft, writing – review & editing.

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Supplementary File 1. Responses to piloting of brief questionnaire at Brunel University London

Supplementary Table 1. Demographics of pilot sample (*n*=235).

Research discipline*	n/%
Computing	23/235 (9.8%)
Engineering and technology	19/235 (8.1%)
Social sciences	19/235 (8.1%)
Business and management	18/235 (7.7%)
Subjects allied to medicine	16/235 (6.8%)
Biological and sport sciences	14/235 (6%)
Psychology	11/235 (4.7%)
Law	10/235 (4.3%)
Education and teaching	5/235 (2.1%)
Humanities and liberal arts (non-specific)	3/235 (1.3%)
Mathematical sciences	3/235 (1.3%)
Combined and general studies	2/235 (0.9%)
Geographical and environmental studies	2/235 (0.9%)
Physical sciences	2/235 (0.9%)
Architecture, building and planning	1/235 (0.4%)
Agriculture, food and related studies	1/235 (0.4%)
General and others in sciences	1/235 (0.4%)
Historical, philosophical and religious studies	1/235 (0.4%)
Medicine & dentistry	1/235 (0.4%)
Communications and media	0/235 (0%)
Creative arts and design	0/235 (0%)
Language and area studies	0/235 (0%)
Veterinary sciences	0/235 (0%)
No response	83/235 (35.3%)
Research methods experience	
Mixed	70/235 (29.8%)
Quantitative	38/235 (16.2%)
Qualitative	28/235 (11.9%)
Other	4/235 (1.7%)
No response	95/235 (40.4%)
Career Level	
Doctoral Researchers	82/235 (34.9%)
Lecturer	18/235 (7.7%)
Senior Lecturer	16/235 (6.8%)
Professor	12/235 (5.1%)
Research Fellow	9/235 (3.8%)
Reader	7/235 (3.0%)
Senior Research Fellow	1/235 (0.4%)
Other	4/235 (1.7%)
No response	86/235 (36.6%)
College	
College of Health, Medicine and Life Sciences (CHMLS)	53/235 (22.6%)

College of Business, Arts and Social Sciences (CBASS),	51/235 (21.7%)
College of Engineering, Design and Physical Sciences (CDEPS)	49/235 (20.9%)
Brunel Centre for Advanced Solidification Technology (BCAST)	2/235 (0.9%)
Missing	80/235 (34%)
Member of a Research Group	63/235 (26.8%)
Current member of institution's Open Research Working Group	14/235 (6.0%)
Interested in being involved in Open Research initiatives at institution	103/235 (43.8%)
Aware of the UK Reproducibility Network (UKRN)	26/235 (11.1%)

Note: * Data collected and presented using HESA's Common Aggregation Hierarchy https://www.hesa.ac.uk/support/documentation/hecos/cah-list.

Supplementary Table 2. Open Research awareness and experience across pilot sample (*n*=235).

	I'm aware of this	Not applicable to my research	I've used this*
Open Research *(sometimes referred to as Open Scholarship or, in a more narrow application, Open Science)*	*n*=123 / 52.3%	*n*=9 / 3.8%	*n*=67 / 29.6%
Study Preregistration *(e.g., pre-analysis plan, prospective registration)*	*n*=59 / 25.1%	*n*=7 / 3.0%	*n*=32 / 14.0%
Registered Reports *(format of empirical article where a study proposal is reviewed before the research is undertaken)*	*n*=54 / 23%	*n*=7 / 3.0%	*n*=21 / 9.2%
Open Materials *(making research materials publicly available e.g experiments, questionnaires, intervention materials)*	*n*=112 / 47.7%	*n*=7 / 3.0%	*n*=57 / 25%
Open Data *(making research data publicly available, e.g FAIR data)*	*n*=124 / 52.8%	*n*=6 / 2.6%	*n*=63 / 27.5%
Open Code *(making analysis code publicly available)*	*n*=149 / 36.6%	*n*=16 / 6.8%	*n*=36 / 16.4%
Preprints *(making research papers available prior to journal peer-review in an online repository)*	*n*=108 / 46%	*n*=2 / 0.9%	*n*=56 / 24.0%
Open Peer Review *(journal or grant peer review where authors and reviewers are aware of each other's identity)*	*n*=115 / 48.9%	*n*=1 / 0.4%	*n*=52 / 22.2%
Open Access Publication *(making peer-reviewed papers or other publications publicly available)*	*n*=156 / 66.4%	*n*=1 / 0.4%	*n*=109 / 46.6%
Replication Studies *(research attempting to reproduce the methods and findings of prior research)*	*n*=95 / 40.4%	*n*=9 / 3.8%	*n*=18 / 8.0%
Research Co-Production *(researchers, public and practitioners working together in research, sharing responsibility throughout a project)*	*n*=97 / 41.3%	*n*=4 / 1.7%	*n*=43 / 18.6%

 *Percentages for the uptake of Open Research practices were calculated only for participants deeming that the given behaviour was applicable to their research.

Supplementary Table 3. Recommended strategies to increase Open Research practices across pilot sample (*n*=235).

Strategy to increase Open Research	COM-B component	*n*/%
More information on open research practices	Psychological capability	*n*=92 / 39.1%
More training using open research practices	Psychological capability	*n*=81 / 34.5%
Dedicated funding for open research	Physical opportunity	*n*=64 / 27.2%
Incentives from funders, institutions or other regulators	Social opportunity	*n*=61 / 26%
Support from senior researchers (e.g., supervisors and principal investigators)	Social opportunity	*n*=55 / 23.4%
Understanding ethical issues (e.g., issues around data sharing)	Psychological opportunity	*n*=53 / 22.6%
Supporting infrastructure (e.g., sufficient storage for open data)	Physical opportunity	*n*=49 / 20.9%
Recognition of open research in promotion and recruitment criteria	Social opportunity	*n*=44 / 18.7%
More time	Physical opportunity	*n*=36 / 15.3%
Workload dedicated to open research	Physical opportunity	*n*=33 / 14%
Need for more positive beliefs about open research	Reflective motivation	*n*=29 / 12.3%
Support from junior researchers (e.g., PhD students, early career researchers)	Social opportunity	*n*=20 / 8.5%
Nothing		*n*=4 / 1.7%
I do not plan to take up open research practices	Reflective motivation	*n*=2 / 0.9%
Additional strategies suggested		*n*=10 / 4.3%

Note: Respondents were asked to select up to 5 options.

Supplementary File 2. Brief Open Research Survey (BORS) used in this study

Q1 What university/institution are you based at?

_____

Q2 What department of this university/institution are you based at?

_____

Q3 Are you a member of a Research Group at this university/institution?

○ Yes (please specify) _____

○ No

Q4a Which of the following research practices are you aware of? (Tick all that apply)

	I'm aware of this
Open Research (sometimes referred to as Open Scholarship or, in a more narrow application, Open Science)	☐
Study Preregistration (e.g pre-analysis plan, prospective registration)	☐
Registered Reports (format of empirical article where a study proposal is reviewed before the research is undertaken)	☐
Open Materials (making research materials publicly available e.g experiments, questionnaires, intervention materials)	☐
Open Data (making research data publicly available, e.g FAIR data)	☐
Open Code (making analysis code publicly available)	☐
Preprints (making research papers available prior to journal peer-review in an online repository)	☐
Open Peer Review (journal or grant peer review where authors and reviewers are aware of each other's identity)	☐
Open Access Publication (making peer-reviewed papers or other publications publicly available)	☐
Replication Studies (research attempting to reproduce the methods and findings of prior research)	☐
Research Co-production (researchers, public and practitioners working together in research, sharing responsibility throughout a project)	☐

Q4b Which of the research practices have you used? (Tick all that apply)

	I've used this	I've not used this	Not applicable to my research
Open Research (sometimes referred to as Open Scholarship or, in a more narrow application, Open Science)	○	○	○
Study Preregistration (e.g pre-analysis plan, prospective registration)	○	○	○
Registered Reports (format of empirical article where a study proposal is reviewed before the research is undertaken)	○	○	○
Open Materials (making research materials publicly available e.g experiments, questionnaires, intervention materials)	○	○	○
Open Data (making research data publicly available, e.g FAIR data)	○	○	○
Open Code (making analysis code publicly available)	○	○	○
Preprints (making research papers available prior to journal peer-review in an online repository)	○	○	○
Open Peer Review (journal or grant peer review where authors and reviewers are aware of each other's identity)	○	○	○
Open Access Publication (making peer-reviewed papers or other publications publicly available)	○	○	○
Replication Studies (research attempting to reproduce the methods and findings of prior research)	○	○	○
Research Co-production (researchers, public and practitioners working together in research, sharing responsibility throughout a project)	○	○	○

Q5 What would help you to use more Open Research practices? Please select up to 5

☐ More information on open research practices

☐ More training using open research practices

☐ Understanding ethical issues (e.g issues around data sharing)

☐ Supporting infrastructure (e.g. sufficient storage for open data)

☐ More time

☐ Workload dedicated to open research

☐ Dedicated funding for open research

☐ Incentives from funders, institutions or other regulators

☐ Recognition of open research in promotion and recruitment criteria

☐ Support from senior researchers (e.g. supervisors and principal investigators)

☐ Support from junior researchers (e.g. PhD students, early career researchers)

☐ Need for more positive beliefs about open research

☐ I do not plan to take up open research practices

☐ Nothing

☐   Something else (please specify):

_____

Q6 What discipline do you research in? (Pick the discipline most relevant to you)

○ Medicine & dentistry

○ Subjects allied to medicine

○ Biological and sport sciences

○ Psychology

○ Veterinary sciences

○ Agriculture, food and related studies

○ Physical sciences

○ General and others in sciences

○ Mathematical sciences

○ Engineering and technology

○ Computing

○ Geographical and environmental studies

○ Architecture, building and planning

○ Humanities and liberal arts (non-specific)

○ Social sciences

○ Law

○ Business and management

○ Communications and media

○ Language and area studies

○ Historical, philosophical and religious studies

○ Creative arts and design

○ Education and teaching

○ Combined and general studies

Q7 How would you describe the research methods you use?

○ Quantitative

○ Qualitative

○ Mixed

○ Other (please specify) _____

Q8 What is your career level?

○ Professor

○ Reader

○ Senior Lecturer

○ Lecturer

○ Senior Research Fellow

○ Research Fellow

○ PhD Student

○ Other (please specify) _____

Q9a Are you a member of your institution's Open Research Working Group?

○ Yes

○ No

Q9b Would you be interested in being involved in Open Research initiatives at your institution?

○ Yes

○ No

Q10 Are you aware of the UK Reproducibility Network (UKRN)?

○ Yes

○ No

Q11 Do you have any other comments?

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