GOOD CONDUCT IN AUTHORSHIP AND PUBLICATION PRACTICE

AN INTRODUCTORY GUIDE

Purpose of the guide

This guide accompanies the online training developed for researchers at the University of Edinburgh on Good Conduct in Authorship and Publication Practice, as part of the wider online training on Research Ethics and Integrity developed by the Institute for Academic Development. The content of this guide is identical to that provided in the online training, but will not include any non-original materials such as the reflective practice exercises, case studies or other restricted materials. This guide is the open access version of the restricted online training materials, and it is licensed for re-use as a CC-BY-NC as per the license agreement detailed in the footer. If using this content elsewhere you should give appropriate attribution to the authors and include the logos as shown at the bottom of each page.

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Content

Introduction

What this guide will cover

In this guide you will learn about the principles that:

- underpin publication ethics policies and open research;

- define good conduct in authorship and peer review;

- define and underpin good conduct in the reporting of research outputs;

- maintain the integrity of the scholarly record.

You will also:

- reflect on how these principles and practices apply to you and your work;

- learn about freely available tools and resources that support good practice.

The guide includes 6 units:

Unit 1. Publication ethics: principles and good practice

Topics include:

- The roles and responsibilities of researchers, journals, institutions and research funders;

- Legal, ethical and regulatory requirements;

- Plagiarism, text recycling and duplicate publication;

- Competing interests.

Unit 2. Principles guiding good practice in authorship and contributorship

Topics include:

- Responsibilities of, and good practices in, authorship;

- Misconduct and questionable conduct in authorship.

Unit 3. Peer review: principles and good practice

Topics include:

- The responsibilities and ethics of peer review;

- Misconduct in peer review;

- The different models of peer review and what they require of reviewers.

Unit 4. Reporting research outputs: principles and good practice

Topics include:

- The different types of research outputs and outcomes;

- Research output reporting requirements and expectations;

- Reporting requirements for research involving humans and animals.

Unit 5. Open research and IP: principles and good practice

Topics include:

- Open research policy requirements and related policies;

- Resources available to support open access, data sharing and open source software and code practices.

Unit 6. Misrepresentation and distortion of the scholarly record

Topics include:

- Good and poor practices when publishing research outputs;

- Sources of bias and other factors that can contribute to poor practice;

- The consequences of poor practice on the integrity of the scholarly record.

How to use this guide

The content of each Unit includes key principles, policies and expectations that are relevant to all university staff and students (STEM & AHSS). Please click the links provided for additional information.

Depending on the nature of your work, and the professional roles or responsibilities you hold, there may be additional references that are applicable to you.

It is also important to recognise that expectations regarding good research conduct can depend on your career stage. For example, those in more senior roles are expected to model good practice and to support and enable good practice among colleagues and trainees.

> We recommended that you use the units in this guide to reflect upon what good practice means in the context of your own work. Where there are specific policies that apply to students, these are flagged.

Throughout this guide, we use the terms:

- **STEM** (for science, technology, engineering, and mathematics), and

- **AHSS** (for arts, humanities, and social sciences).

We use these terms to distinguish where there are different expectations or practices in these academic areas.

Please use these terms to identify the practice that is most relevant to you and your work.

University policies and guidance discussed

General

- [Academic misconduct guidance (for students)](#) – covered in Unit 1

- [Research misconduct policy](#) – covered in Units 1, 2, 3 and 6

- [Research Publications and Copyright policy](#) – covered in Units 1, 2, 4 and 5

- [Conflict of interest policy](#) – covered in Units 1, 2 and 3

- [Research Data Management Policy](#) – covered in Units 4, 5 and 6

- [Intellectual Property commercialisation policy](#) – covered in Unit 5

- [Student intellectual property rights policy](#) – covered in Unit 5

STEM

- [College of Medicine and Veterinary Medicine Fair Publication Policy](#) – covered in Units 2 and 5

- [School of Geosciences Authorship and Publication Ethics Policy](#) – covered in Unit 2

AHSS

- [CAHSS Research Ethics and Data Protection Briefing Note](#) – covered in Unit 5

Learning outcomes

After completing this training you will:

- Have an understanding of the principles and expectations that underpin publication ethics policies and open research practices (Units 1, 4 & 5);

- Have developed your awareness of good conduct in authorship and peer review (Units 2 & 3);

- Be able to reflect upon good practice in the reporting of research outputs and how they apply to you and your work (Units 1-6);

- Be aware of freely available tools and resources that support good practice and the integrity of the scholarly record (Units 1-6).

Unit 1. An introduction to publication ethics: principles and good practice

In Unit 1, you will explore:

- what we mean by publication ethics;

- the roles and responsibilities of researchers, journals, institutions and research funders;

- policies that uphold and maintain responsible and ethical practices in scholarly publishing;

- what constitutes plagiarism and competing interests;

- how breaches in publication ethics policies and standards are handled at the University and by journals.

What do we mean by publication ethics?

Publication ethics describes the policies and practices that define and uphold best ethical practice in scholarly publishing.

Typically, journals, universities, research institutes, companies, and funders will have policies:

- that define responsible and ethical practice in the authorship, evaluation and execution of research;

- that define responsible practice, and community standards, for the sharing or publication of research outputs and results in repositories and scholarly publications;

- that support ethical and legal standards on research ethics.

Who has an interest in publication ethics?

Those involved in the evaluation, funding, approval, planning, execution, analysis, preparation and reporting of research, and of research outputs. Those who participate in research and have an interest in what is reported in scholarly publications.

For example:

- Funders, universities and institutes;

- Research ethics committees;

- Authors, Reviewers, Editors and Editorial board members;

- Research participants and readers;

- Journal owners and publishers;

- Editorial and research integrity organisations, such as COPE, UKRIO and ICMJE;

- Stakeholders, whose policies, work and decisions are informed by research outputs and scholarly publications (e.g. governments, policy makers, charities, non-governmental organisations and patient groups).

Publication ethics is a shared responsibility

Research funders, universities, research institutes, and companies have policies and practices that:

- support research governance;

- promote, support, set and uphold standards for responsible conduct in the performance, evaluation, publication and sharing of research;

- support good practice in authorship, competing interest disclosure, research reporting, and data practices;

- procedures for dealing with allegations of questionable research practice or research misconduct.
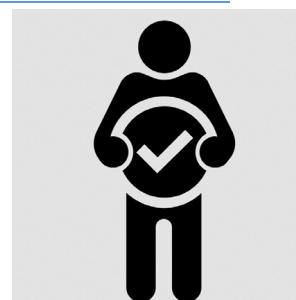
Image by: Makermet Creative, CC0, via Wikimedia Commons

See the end of this Unit for policies at the University of Edinburgh that concern good practice in publication ethics.

Researchers

Researchers participate in scholarly publishing in different ways, for example, as

- Readers

- Authors

- Reviewers

- Academic editors

- Editorial board members.

Researchers are expected to comply with the relevant policies and practices on research ethics, authorship, peer review, research reporting, and publishing provided by institutions, research funders and publishers.

Journal editors

Professional and academic journal editors are expected to:

- act ethically, objectively and with editorial independence;
- declare their conflicts of interest;
- uphold a publisher's publication ethics policies;
- deal with allegations of misconduct according to best practice and journal policy;
- maintain the integrity of the published scholarly record.

Journal owners and publishers typically manage the legal and commercial aspects of publishing. They also provide the resources required to support best practice, to maintain journal standards and the integrity of the published scholarly record. Scholarly publishers must also respect editorial independence (i.e. not influence editorial decisions for commercial or other gain).

Policies on research involving humans

People participate in research in different ways. For example, in the Arts, Humanities and Social Sciences (AHSS), individuals might agree to researchers using personal data that they have shared on social media.

In biomedical research, individuals can participate in research by sharing confidential medical information and biomedical samples with researchers.

Image by: Red Cross Red Crescent Climate Centre, CC0, via Wikimedia Commons

Ethical principles and legal requirements must be met when performing research on human research subjects or participants, and/or when reporting research and research data derived from humans.

Although some requirements vary between countries, the international standards that apply to research involving humans are usually reflected in publishers' publication ethics policies.

Many publishers will also require you to complete a checklist at submission to confirm that the required ethical standards have been met.
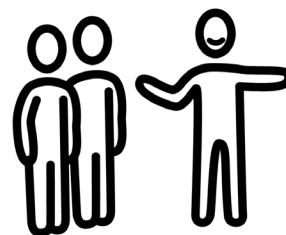
Publisher policies on research involving humans

For research involving humans, most journal publishers require that authors:

- Provide a statement to confirm that appropriate ethical approval was granted for the research, and the details of the Research Ethics Committee (REC) or Institutional Review Board (IRB) that provided approval;

- Confirm that the study conforms to recognized standards for research involving humans, particularly the Ethical Principles for Medical Research Involving Human Subjects (known as the Declaration of Helsinki);

- Have obtained informed consent from research participants or from a legally authorized representative;

- Have met legal and ethical standards to protect participants' privacy and the confidentiality of their personal data (see Unit 4 for more);

- Have met community standards for the preregistration and reporting of clinical trials (see Unit 4 for more).

Publisher policies on research involving animals

For research involving animals, most journals require that authors:

- Provide a statement to confirm that appropriate ethical approval was granted for the research by a named ethical review or animal welfare committee.

- Confirm that their study conforms to relevant laws and standards for research involving animals.

Some journals also ask that authors:

- Adhere to animal research reporting standards, for example, the ARRIVE guidelines (see Unit 4).

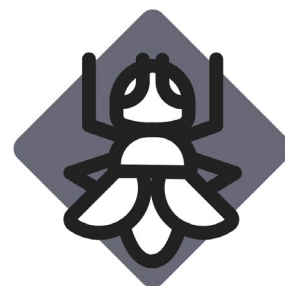- Implement the 3Rs principles of replacement, reduction and refinement.

Image by: DataBase Center for Life Science, CC BY via Wikimedia Commons

Journal policies on research ethics also cover

Dual use research of concern: this is research that has both beneficial and harmful applications. Most journals require authors to disclose if their reported research has such a dual use.

Research that poses other hazards or risks, caused for example, by products, chemicals, operations, or technologies that pose a threat to public health and safety, the environment, plants, or animals.

> Having looked at what we mean by publication ethics, and who is responsible for it, we now turn to specific publication ethics-related issues. Scholarly journals and the University of Edinburgh have policies on these issues to support good practice and to deal with poor practice or misconduct.
>
> **We begin by looking at plagiarism.**

Plagiarism

What constitutes plagiarism?

The University of Edinburgh's Academic Misconduct Policy for students defines plagiarism as:

> 'The act of copying or including in one's own work, without adequate acknowledgement, intentionally or unintentionally, the work of another or your own previously assessed original work.'
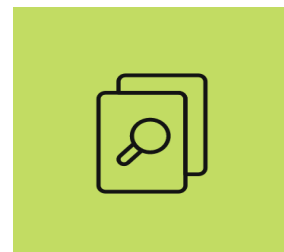
Image by:
thenounproject.com

Academic misconduct policy

The University of Edinburgh's Research Misconduct Policy, **which applies to all University staff**, defines plagiarism as:

> 'Using other people's material without giving proper credit.'

The University considers plagiarism to be a form of research misconduct.

> **Plagiarism is often considered to be a form of theft** of other people's work, words, ideas, intellectual property, and/or other research and creative outputs.

What constitutes self plagiarism?

Self plagiarism is defined by the World Association of Medical Editors (WAME) as:

> 'The practice of an author using portions of their previous writings on the same topic in another of their publications, without specifically citing it formally in quotes.'

WAME also highlights that:

> 'there is no consensus as to how many of one's own words one can use before it is truly "plagiarism." Probably for this reason, self-plagiarism is not regarded in the same light as plagiarism of the ideas and words of other individuals.'

What constitutes text recycling?

Authors might have a legitimate reason to copy text they have published elsewhere, for example, to consistently describe a method to support research reproducibility.

For this reason, this form of self plagiarism is now also known as text recycling.

Journals vary in how they deal with text recycling. Depending on the context, and how transparent the authors have been, some journals might consider text recycling to be acceptable. Others might consider it to be unethical, a breach of publication ethics, and potentially a breach of copyright.

For more information on how publishers assess self plagiarised text in scholarly publications, see the COPE guidelines on text recycling and visit textrecycling.org.

To learn more watch this COPE webinar on text recycling in scholarly publications (or bookmark it to return to when you have more time. It has several speakers and its runtime is 1 hr 11 mins).

Summary points on plagiarism

- **Be aware that plagiarism has serious consequences.** Publishers and editors will reject submitted manuscripts and retract scholarly publications found to contain plagiarised text. They will also contact the authors' institution to investigate. Most academic institutions (including the University of Edinburgh) consider plagiarism to constitute research misconduct.

- Many journals use plagiarism checking software to screen manuscripts at submission and/or after revision to detect plagiarised text prior to publication.

- **If you spot plagiarism in a scholarly publication** (or any other form of potential research misconduct), contact the journal editor or publisher to report your concern.

What constitutes duplicate publication?

The ICMJE defines duplicate (aka redundant) publication as the:

> 'publication of a paper that overlaps substantially with one already published, without clear, visible reference to the previous publication… Duplicate publication of original research is particularly problematic because it can result in the inadvertent double-counting of data or inappropriate weighting of the results of a single study, which distorts the available evidence.'

Preprints

Most journals do not consider preprints to be a prior or duplicated publication, but authors should check for a journal's policy on preprints and inform a journal if their submitted work has been previously posted on a preprint server. ICMJE also recommends that authors should select preprint servers that clearly identify preprints as not being peer-reviewed work.

Competing interests (also known as conflicts of interest)

What is a competing interest?

The University of Edinburgh defines a competing interest as:

> 'A situation in which an employee has a private or personal interest which is likely to appear to influence the objective exercise of an aspect(s) of their University duties.
> For the purpose of this Policy, the term 'conflict of interest' includes perceived and potential, as well as actual conflicts of interest.
> - **a perceived conflict of interest** is one which a reasonable person would consider likely to compromise objectivity.
> - **a potential conflict of interest** is a situation which could develop into an actual or perceived conflict of interest.'

Image by: KDS4444, CC0, via Wikimedia Commons

There are three main types of competing interest to disclose in scholarly publishing:

1. **Financial competing interests** can include but are not limited to:
   - ownership of stocks or shares;
   - patent applications (pending or actual);
   - research grants;
   - paid employment or consultancy;
   - board memberships;
   - being in receipt of free equipment, travel grants, honoraria and gifts.

2. **Professional competing interests** can include but are not limited to:
   - being in a collaborative relationship with a researcher whose work you are assessing;
   - being a member of an advisory board (eg of a governmental/non governmental organisation, research institution, company or funder);
   - being a member of a lobbying or advocacy organisation;
   - paid employment or consultancy.

3. **Personal competing interests** can include but are not limited to:
   - being in a personal relationship with someone involved in the submission or evaluation of a scholarly article (such as with an author, reviewer, editor, or editorial board member);
     - personal relationships can include a spouse, family member, friend, current or previous mentor or supervisor, or an adversary.
   - holding personal beliefs (such as political, religious, ideological, or cultural beliefs or convictions) that might interfere with an unbiased or fair and transparent publication process.

Having a competing interest does not imply wrongdoing, however:

- **You must disclose your competing interests** if you are a researcher, author, reviewer, editor or editorial board member for reasons of transparency and to allow others (research funders, editors, reviewers and readers) to take them into account when assessing or reading your work.
- If you are unsure if you have a competing interest to disclose, you should always raise the potential competing interest and ask for advice.
- **You should disclose** both actual competing interests and situations where you could be perceived to lack objectivity. This applies when reporting or assessing work submitted for publication or funding.
- To further explore your understanding of what constitutes a competing interest, see The University of Edinburgh's Conflict of Interest Policy and the reflection on practice at the end of this Unit.

What happens if you fail to disclose a competing interest?

The University of Edinburgh considers failure to declare competing interests to be a form of research misconduct.

Most publishers require authors, reviewers, editors and editorial board members to disclose their competing interests to the journal. Often authors are also required to publish a competing interest statement with their article to disclose whether or not they have competing interests to declare.

COPE recommends that where author(s) fail to disclose a major competing interest (one that would have informed the assessment and recommendation of the editors or reviewers), an article should be retracted and the authors' institution contacted to investigate.

How are breaches of publication ethics policies dealt with?

The role of the journal or publisher is to maintain the integrity of the published record.

When an issue or concern is reported to them:

- A publisher or journal will initiate its investigation process and will contact the authors and their institution for information and assistance.

- Based on the information ascertained, a journal will correct or retract a publication, publish an expression of concern, or take no further action. See COPE's retraction guidelines for more information on the issues that result in retraction.

Image by: Consumer Financial Protection Bureau, CC0, via Wikimedia Commons

The role of the University is to investigate and to decide outcomes for individuals concerned.

- When an issue or concern is reported to them:

- The University of Edinburgh investigates allegations of research misconduct in line with UKRIO's Procedure for the Investigation of Misconduct in Research'.

Questions to ask

How can I inadvertently avoid committing plagiarism?

- **Text recycling:** be aware of [current guidance on text recycling](#) and check what a journal says about text recycling and plagiarism in their publication ethics policies.

- **Rewrite text** that explains ideas or concepts you have published elsewhere. Plagiarism constitutes text copied 'verbatim' (meaning word for word) from another source without acknowledgement.

- **Do not include copied or recycled text** in those parts of a scholarly publication that should be entirely original, such as the results section of a research article.

Image by: Pete Fecteau, CC0, via Wikimedia Commons

How can I tell if I have a competing interest to disclose?

- **Check the University's**, your funder's and/or journal guidelines for examples of situations that constitute a competing interest for researchers, authors, reviewers and editors.

- **One rule of thumb** is to disclose any information that could, when revealed at a later date, leave a reasonable person to feel misled or deceived, or that could embarrass you were this information to become publicly known.

Further training and resources

At the University of Edinburgh

[Conflict of interest policy](#)

[Research Misconduct policy](#)

[Researchers' responsibilities relating to research integrity and ethics at the University of Edinburgh](#)

[Research Publications and Copyright policy](#)

[Information about the University's Animal Welfare and Ethical Review Board](#)

Elsewhere

[COPE's Introduction to Publication Ethics](#)

[UKRIO Code of Practice for Research](#)

[UUK Concordat for Research Integrity](#)

[Wiley Best Practice Guidelines for Research Integrity and Publishing Ethics](#)

Unit 2. Good practice in authorship and contributorship

In Unit 2, you will explore:

- who qualifies to be an author & why authorship matters;

- the roles and responsibilities of authors;

- what constitutes good practice in authorship;

- pressure to publish and conduct in authorship;

- misconduct in authorship and its consequences;

- publisher policies on authorship;

- good practice principles in the authorship of preprints and other research outputs;

- how to assess if your contribution qualifies for authorship;

- how to avoid getting into authorship disputes;

Who has an interest in good practice in authorship?

Those involved in the evaluation, funding, approval, planning, execution, analysis, preparation and reporting of research and of research outputs. And those who participate in research or have an interest in what is reported in scholarly publications.

For example:

- Research funders, universities and institutes;

- Research ethics committees;

- Researchers, research staff and academics;

- Authors, Reviewers, and Editors;

- Research participants and readers;

- Journal owners and publishers;

- Editorial and research integrity organisations, such as COPE, UKRIO and ICMJE;

- Societal stakeholders, whose policies, work and decisions are informed by research outputs and scholarly publications.

Why authorship matters

> 'Authorship conveys significant privileges, responsibilities, and legal rights; in the scholarly arena, it also forms the basis for rewards and career advancement.'
>
> COPE Discussion Document: Authorship

> 'Correct authorship of research publications matter because authorship confers credit, carries responsibility, and readers should know who has done the research.'
>
> UKRIO Good Practice in Research: Authorship

Authorship vs contributorship

Many scholarly publications now have criteria for authorship that include contributions that do not involve writing a scholarly publication.

For this reason, many now refer to contributorship rather than to authorship.

Image by: OCHA Visual Information Unit, CC0, via Wikimedia Commons

> **In this unit, and in the other units of this guide,** the term authorship is used in this broader sense and encompasses both contributorship and authorship.

Who is an author?

There is no single, universal definition of authorship, and different academic disciplines have different standards and practices that apply to authorship.

In the Arts, Humanities and Social Sciences, scholarly publications authored by a single academic are relatively common.

In other academic disciplines, particularly the STEM disciplines, scholarly articles are more typically authored by several, and sometimes numerous, individuals.

The roles of authors

Authors have different roles in scholarly publications. Each comes with differing responsibilities and expectations, and authors can adopt one or more of these roles in a single publication.

- **Co-author**: an individual (such as a researcher, research staff member or academic) who has significantly contributed to conducting, preparing, revising and finalising work for publication with other authors.

- **Lead author:** the author who has done most of the work reported in a publication, sometimes also known as the first author.

- **Corresponding author:** the author who takes primary responsibility for communicating with the journal during the editorial and publication process, and with readers after publication.

- **Senior author:** often the author in whose team the work was done and who oversees the manuscript's preparation and sometimes the work reported in it.

Authorship comes with responsibility

As an author, you undertake to be held accountable and responsible for the work reported in a scholarly publication.

You are individually responsible for single-author publications and jointly responsible for multi-author publications.

This includes for the integrity of the work reported and for dealing appropriately and promptly with any issues relating to it.

Academic and research leaders, who are typically senior authors on scholarly articles, are expected to model good practice in authorship, ensure authorship policies are adhered to by team members and collaborators, and to use fair and transparent processes when dealing with issues relating to authorship.

Good practice in authorship

What constitutes good practice in authorship?

As an author, you should:

- be able to identify the specific contribution that you have made to a manuscript and, for multi-author publications, have confidence in the integrity of your co-authors' contributions;

- critically review drafts of a manuscript in preparation (or the parts you have contributed to it, for example, in multidisciplinary publications);

- approve the final version submitted for publication;

- provide accurate and up-to-date information to a publisher about your contact details and affiliations;

- disclose competing interests.

SHARE & PUBLISH
Image by: Gaelen Pinnock CC BY-SA 4.0 Wikimedia Commons

Good authorship practice for multi-author publications

- **Agree at the outset** of a project the criteria for determining the authorship of publication(s).

- **Use fair and transparent processes** to determine authorship (see the ICMJE's recommendations).

- **Where required, reflect the extent** of each author's contribution appropriately through their position in the authorship list. Those making the greatest contribution should be listed first.

- **Make it clear where equal authorship applies**, including joint first authorships.

- **Seek prompt advice** from your institution or funder, when needed, to resolve authorship disputes. Journals and publishers will not arbitrate in these disputes.

Good authorship practice for senior and corresponding authors

- **Senior authors** oversee the preparation of a manuscript and can make final decisions about the order of authors. These decisions should be fair, transparent and, where appropriate, reflect each person's relative contributions to the work.

- **Corresponding authors** take primary responsibility for communicating with the journal or publisher during the editorial and publication process. They also ensure a publisher's administrative requirements are properly completed. This can include providing details of authorship, ethics committee approval, clinical trial registration documentation, and disclosure of competing interests. They are also responsible for responding to requests and queries from readers after publication.

Good authorship practice for cross boundary, collaborative research

It can be challenging in cross boundary collaborations to achieve a common understanding of what constitutes good conduct in research and authorship, particularly where different incentives, standards and practices apply.

Collaborating partners should therefore agree at the outset of a project:

- how data, research records, and intellectual property will be owned, managed and shared;

- how publication and other dissemination decisions will be made;

- how authorship and acknowledgement will be assigned, and how the contributions of all partners, especially junior partners, will receive full and appropriate recognition;

- how allegations of misconduct, questionable or irresponsible research and/or authorship practice will be handled;

- their accountability to each other, to funders and to other stakeholders.

For more guidance, see the Montreal Statement on Research Integrity in Cross-Boundary Research Collaborations.

Ordering authorship lists: navigating different practices

How authorship positions are assigned in scholarly publications varies among different academic disciplines. This requires academics to be aware of and to navigate different practices, and to use fair and transparent practices.

For example, authors can be listed:

- alphabetically, by their last name;

- in order of their respective seniority;

- based on their relative contribution, with the authors who have done the most work appearing first in the authorship list.

> **When authorship position is based on relative contribution** different authorship positions have different values, with the status, credit and rewards of authorship predominantly going to the first, second, last and corresponding authorships.
>
> As we discuss later, this can lead to questionable practices in the assignment of authors to these authorship positions.

Questionable conduct in authorship

Pressure to publish and questionable conduct in authorship

Scholarly publications communicate and disseminate ideas, findings and discoveries but are also used to evaluate academics and researchers for funding and jobs.

The use of publications to evaluate academics creates pressures to publish.

Image by: Franks Valli, CC BY-SA 4.0 Wikimedia Commonsc

These pressures can contribute to questionable conduct and to misconduct in authorship, which we look at next.

Questionable conduct and misconduct in authorship can include:

Guest, gift or honorary authorship. When someone is included as an author who has not contributed significantly to a project and/or publication and who does not meet the accepted criteria for authorship.

Ghost authorship or denial of authorship. Ghost authorship/denial of authorship describes someone who has contributed significantly to a project and/or publication and meets the criteria for authorship, but is not included in the authorship list.

Unapproved changes to authorship lists. When authors alter the authorship list of a submitted manuscript (by adding or removing authors), without the knowledge or approval of their co-authors.

Authorship for sale. When academics or researchers purchase authorships (before publication), without having contributed to the work reported, to obtain career advancement and/or cash rewards.

Disputes about the ordering of authors. Academics can fail to agree on who should be an author and on their respective positions in an authorship list.

Inappropriate assignment of authorship position. Senior researchers and academics can inappropriately assign authorship positions to colleagues and team members that do not properly reflect that person's contribution to the reported work. Some use unfair and non-transparent practices to do so.

Inappropriate bargaining for authorship. Some researchers withhold published resources to bargain for authorship while others lobby team leaders for a position on an authorship list that does not reflect their contribution to a project and/or the reported work.

The consequences of misconduct in authorship

The University of Edinburgh considers the following authorship conduct to constitute research misconduct:

- misrepresentation of involvement, such as inappropriate claims to authorship or attribution of work;
- failure to declare competing interests.

The University's research misconduct policy explains how allegations of research misconduct are handled.

Publishers

Most will withdraw from consideration submitted manuscripts that are in breach of their publication ethics policies on authorship and will contact the authors' institution to investigate. When breaches come to light after publication, publishers will look to correct the scholarly record through retraction or correction of the published work.

To learn more about good practice and misconduct in authorship watch a video on responsible, ethical and fair authorship By Irene Hames for UKRIO (runtime: 42 minutes).

Publisher policies and good practice

Publishers policies on authorship

Publishers have a range of policies to support good practice in authorship.

Image by: Latemplanza, CC BY-SA 4.0 via Wikimedia Commons

Criteria for authorship: The ICMJE's authorship criteria is commonly used by both STEM and AHSS journals; some journals set additional or other criteria.
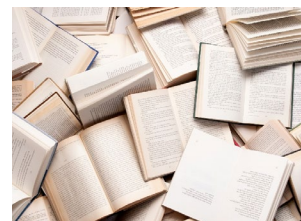
Author contribution statement: some require authors to provide a statement that lists what each author has contributed to the reported work. In some disciplines, a controlled taxonomy is used to describe these contributions (such as the CRediT taxonomy). When someone's contribution does not meet the criteria for authorship, they should be acknowledged instead.

Competing interest disclosure: most require authors to disclose competing interests that might influence how their work is assessed and/or received (see Unit 1 for more on competing interests and their disclosure).

Co-author approval: most require co-authors to approve the final version submitted for publication and to approve changes to the authorship list.

Authors can be asked to verify on submission that:

- the reported work is entirely original and has the required ethical approval;
- and has been submitted in accordance with the publisher's publication ethics policies.

Corresponding authors can be asked to verify that:

- all authors have approved the final version and agree to its submission;
- the publisher's or journal's submission criteria and publication ethics policies have been met.

What constitutes good practice in the authorship of preprints?

Good practice guidelines relating to the authorship of scholarly articles for publication apply to the authorship of preprints.

This is because:

- preprints can form part of the wider scholarly record once shared via a preprint server or repository even though they are not considered formal publications;

- in some academic disciplines, can be included on job and funding applications and on CVs and so can be used to evaluate academics during their careers.

What constitutes good practice in the authorship of other research outputs?

A range of research outputs can be reported and disseminated independently of formal publications, including datasets, code, software, and protocols.

See Units 4 and 5 for additional reporting requirements for research outputs.

> The principles that underpin good practice in the authorship of scholarly publications also apply to these research outputs, particularly the principles on:
> - **accountability and responsibility** for the integrity of the reported output;
> - **fair credit** given to those who have significantly contributed to the reported output;
> - **obtaining final approval** from contributors before reporting or sharing;
> - **disclosing competing interests;**
> - **reporting outputs in accordance with** community guidelines and expected standards.

Questions to ask

How do I know if my contribution qualifies me to be an author?

- Check the criteria for authorship at the journal or publisher your work is going to be submitted to, to see if you meet their criteria for authorship.

- If you don't yet know which journal or publisher you plan to submit to, check the ICMJE's criteria for authorship.

Image by: Pete Fecteau, CC0, via Wikimedia Commons

- Many publishers require data, methods, protocols, research materials, and research resources to be made available once they are published. Once published, you should not use the provision of these research outputs and resources to bargain for authorship.

- If your contribution to a publication does not meet the criteria for authorship but has informed the work being reported, your contribution should be described in the acknowledgement section of the article.

How can I avoid getting into an authorship dispute?

- Discuss and agree criteria for authorship at the outset of a project or study.

- Document contributions and review regularly as the study or project progresses.

- Before writing begins, agree on the scope of the publication and on whose work will be included.

- Look at COPE's or ICMJE's criteria for authorship to work out if your contributions (and those of other project members) qualify you to be an author. The COPE guidelines provide a helpful list of resources to inform these discussions.

- If you know the journal or publisher you plan to submit to, check their criteria for authorship as well.

- Consider drafting an author contribution statement at an early stage of writing. Make sure only those who qualify for authorship are included as an author.

- Before a manuscript is submitted, make sure that you and all of your co-authors have had an opportunity to comment on it and agree to its submission.

- Note where equal authorships apply.

- Know who to contact at your school, department or college if you have concerns regarding authorship. You can also seek advice from UKRIO's confidential advisory service.

> For more tips on how to avoid authorship disputes, see: COPE's Guide on How to Handle Authorship Disputes for New Researchers.

Further training and resources

At the University of Edinburgh - General

Conflict of interest policy

Research misconduct policy

Research Publications and Copyright policy

Tips for Authors from The University's Information Services

Elsewhere - General

COPE's How to handle authorship disputes: a guide for new researchers (2003)

COPE Discussion Document: Authorship (2019)

Montreal Statement on Research Integrity in Cross Boundary Research Collaborations (2013)

UKRIO Resources on Authorship

UKRIO webinar on Authorship and Publication Ethics by Dr Irene Hames (2020)

At the University of Edinburgh - STEM

College of Medicine and Veterinary Medicine Fair Publication Policy

Edinburgh Clinical Trials: Publication and Acknowledgement Policy

School of Geosciences Authorship and Publication Ethics Policy

Elsewhere - STEM

Authorship framework to improve transparency of industry-sponsored clinical trial publications

ICMJE recommendations: Defining the role of authors and contributors

Elsewhere - AHSS

Co-authorship in the Humanities and Social Sciences

UKRIO Good practice in Internet Mediated Research

Unit 3. Peer review: Principles and good practice

In Unit 3, you will explore:

- the role of the reviewer;

- the ethics of peer review;

- the responsibilities of peer reviewers;

- misconduct in peer review;

- common problems and challenges in peer review;

- the different models of peer review and what they require of reviewers;

- questions to ask if you are invited to peer review;

- how to assess if you have a competing interests to declare as a reviewer;

Who has an interest in good practice in peer review?

Those involved in the evaluation, funding, approval, reporting of research and research outputs, or who maintain the integrity of the scholarly record. Those who participate in research, and who use or rely on what is reported in scholarly publications.

For example:

- Research funders, universities and institutes;

- Researchers and academics;

- Authors, reviewers, and editors;

- Research participants and readers;

- Journal owners and publishers;

- Editorial and research integrity organisations, such as COPE, UKRIO and ICMJE;

- Societal stakeholders, whose policies, work, and decisions depend on the reporting of reliable and verifiable research outputs and scholarly publications.

Peer review is a reciprocal process

Peer review is considered to be a reciprocal process: academics review the work of their peers with the understanding that their peers, in turn, will review the work they submit for publication or funding.

What is the principle role of a peer reviewer?

Peer review practices differ among academic disciplines and in different contexts but the principle role of a reviewer is the same: **to assess the quality, reliability, integrity and (sometimes) the merit of work submitted for publication or funding.**

Here, we focus on the role of peer reviewers in scholarly publishing.

Peer review, integrity and trust

'Peer reviewers play a role in ensuring the integrity of the scholarly record. The peer review process depends to a large extent on the trust and willing participation of the scholarly community and requires that everyone involved behaves responsibly and ethically.'

COPE Ethical Guidelines for Peer Reviewers

Reviewers do not make publishing decisions but they play a key role in:
- influencing what is accepted for publication in their field;
- improving the quality and reliability of published work.

Peer review of books and journal articles

There are key differences between the peer review of books and journal articles, as shown.

Peer review of journal articles	Peer review of books
Whole journal articles are commonly peer reviewed by 2-3 independent reviewers.	Proposals for books, whole books and/or select chapters are peer reviewed by one or more independent reviewers.
Peer review can take place before or after publication.	Peer review usually takes place before publication.
Blinding models are used to remove the identities of reviewers or authors, or both.	Review rarely involves any form of blinding.
Reviewers are expected to act in an unbiased manner when assessing the work under review.	Reviewing can often take into account an author's abilities or character or status and might provide a "reference" as much as a review.
Reviewer reports are generally not edited nor consolidated before being sent to authors.	Reviewer reports are more commonly edited or consolidated.

Source: COPE's Ethical Considerations of Book Publishing

The ethics and responsibilities of peer review

The ethics of peer review in scholarly publishing

Reviewers work within a well-defined ethical framework, and should:

- Agree to review only if they have the expertise and time to do so;

- Respect and maintain confidentiality in a confidential peer-review process;

- Declare any real or potential competing interests (see Unit 1 for more on competing interests);

- Not misrepresent a review as their own work if it is not;

Image by: CC BY created by John Salzarulo from NounProject.com

- Not pass on a manuscript they have agreed to review to someone else in a confidential peer review process, without the journal or publisher's knowledge and approval;

- Not use information obtained during peer review for their own advantage, nor to advantage, disadvantage or to discredit others.

- Be objective, polite and constructive in their comments;

- Be aware of the consequences of making hostile, derogatory, inflammatory, or libellous remarks;

- Consider whether their perspective as a reviewer is influenced by the gender, religion, ethnicity, politics, or nationality of the authors. Or by commercial considerations, or strongly held personal, professional, cultural or other views;

- Decline to review if they cannot provide an objective, unbiased assessment of the work under consideration.

The responsibilities of reviewers

Reviewers have responsibilities to authors and journal editors to:

- declare any competing interests before accepting the invitation to review;

- have the required time and expertise to review;

- provide unbiased, constructive and informative feedback in a timely manner and without unnecessary delay;

- critically and constructively assess the validity, rigour, integrity, reliability, and/or merit of the work being reviewed;

- check research reporting requirements are adhered to;

- provide a clear basis for opinions and/or concerns.

- ensure that the relevant work of others is appropriately cited and/or acknowledged;

- avoid making personal comments or criticisms directed at the authors;

- promptly report to the journal any ethical or legal concerns about the work under review;

- maintain confidentiality in peer reviews systems that require confidentiality (not all do require confidentiality, as discussed later);

- acknowledge colleagues who have contributed to a review (for example, as co-reviewers).

Reviewers have responsibilities to readers to:

- ensure that enough detail and clarity is provided so that readers can:

    - understand the ideas proposed,

    - understand what was done and found,

    - verify the reported work and its findings.

- check that the reported research outputs are made available and in accordance with relevant journal policies, reporting guidelines, and community standards.

Reviewers can also be asked to:

- assess revised versions of manuscripts;

- advise on appeals and rebuttals;

- provide expert advice on ethical and misconduct-related issues;

- help establish technical and/or reporting standards for journals in their fields.

Misconduct and issues in peer review

Misconduct in peer review

Common forms of misconduct by reviewers include:

- Using ideas, text, data, and/or images obtained during the peer review process for their own gain;

- Using peer review to gain citations to their own work;

- Misrepresenting a review as their own work when it is not;

- Breaching confidentiality in a confidential peer review process;

- Failing to disclose competing interests;

- Deliberately delaying the work of a rival;

- Providing a journal with false information about their identity, expertise and/or affiliation;

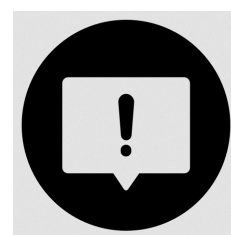- Providing a journal with fake reviewer details or with fake reviews.

Image by: Consumer Financial Protection Bureau, CC0, via Wikimedia Commons

Common concerns about peer review

Concerns about the peer review of journal articles in recent years include that:

- peer review is too slow, slowing down the publication process;

- reviewers can be overly critical;

- reviewers and editors can be biased (both consciously and unconsciously);

- peer review lacks sufficient transparency;

- reviewer reports can be faked, damaging trust in the integrity of peer review;

- peer review is not inclusive, those with the expertise to review are not always invited to do so;

- peer review can be time consuming and difficult to do, and often reviewers do not receive credit for doing it.

Publishers are addressing these concerns by:

- experimenting with different models of peer review (as summarized in a following slide) to improve the speed, transparency, objectivity and standards of peer review;

- taking steps to ensure that all with the required expertise to review are invited to do so, regardless of their gender, ethnicity, career stage or geographical location;

- improving their peer review systems and editorial processes to prevent authors from acting as fake reviewers for their own articles;

- providing academics with more guidance and resources on how to peer review;

- participating in programmes to provide academics with credit for participating in peer review.

Institutions are addressing these concerns by:

- recognising the work that goes into peer review and giving academics credit for undertaking this essential work;

- providing early career researchers with peer review training to equip them with the skills needed to review.

Different models of peer review

Model¥	Reviewers know who the authors are	Authors know who the reviewers are	Reviewers know each other's identities	Reviewers feedback on each other's reports before decision is made	Reviewer reports, editorial letter, author responses published online	Peer review takes place before publication	Peer review takes place after publication
Single-blind	Yes	No*	No	In some journals	No	Yes	No
Double-blind	No	No	No	No	No	Yes	No
Consultative	Yes	No*	No*	Yes	In some journals	Yes	No
Transparent	Yes	No*	No*	In some journals	Yes§	Yes	No
Open (reviewers must provide named reports)	Yes	Yes	In some journals	In some journals	In some journals	Yes	No
Open post-publication review	Yes	Yes	Yes	N/A as article is already published	Yes	No	Yes
Preprint review	Yes	Yes	Yes	N/A as review is for the authors rather than to inform an editorial decision	Yes (reviewer reports and author responses)	Yes	No

¥Some journals might combine these models together (eg consultative and transparent review processes are often used together).

*In some journals, reviewers can choose to disclose their identities on their reviewer reports.

§In some journals, the authors decide if peer review information is published with their article online.

N/A, not applicable.

What different models of peer review require of reviewers

Single-blind and double-blind peer review: Peer review is usually confidential in these models and the authors do not know the identity of the reviewers. In double-blind peer review, the reviewers do not know the identity of the authors. This is intended to reduce bias in peer review but reduces transparency too.

Consultative peer review (sometimes called cross review): This models adds an extra step to the peer review process by allowing reviewers to see and comment on each others' reports before a final decision is made. Reviewers can thus engage in additional discussions about their own and other reviewers' report, particularly if their opinions differ.

Transparent peer review: When a journal publishes key peer review information online; typically, the reviewers' reports, the editorial decision letter, and the authors' responses. Reviewers are not required to disclose their identities in this model but should expect to have their review made public with the published article online.

Open peer review: Reviewers are required to disclose who they are on their reports. This is intended to reduce bias and to improve transparency but can leave some reviewers feeling unable to freely express their concerns and opinions.

Open, post publication, peer review: Articles are published online before undergoing open peer review where named reviewer reports and author responses are published with the article. Depending on the platform, reviewers can be invited by editors, suggested by authors, or can be self-selected individuals.

Preprint peer review: A preprint made openly accessibly via a preprint server is not a formal publication. However, in some disciplines, researchers are encouraged to review preprints before their submission for publication. Preprint review is generally open, and does not require reviewers to provide advice to an editor on the suitability and/or merit of an article for publication in a journal. Instead, they provide authors with direct advice on how to improve their work before its formal submission.

Co-review

This is when an invited reviewer (often called the principal reviewer) asks a colleague to contribute to their review. This could be someone with relevant expertise, or an early career researcher in the principal reviewer's team.

A principal reviewer should:

- secure the agreement of the journal before sharing an unpublished manuscript with a prospective co-reviewer to maintain confidentiality of the peer review process;

- ensure that their co-reviewer discloses their competing interests;

- acknowledge the co-reviewer for their input so that they receive credit for it.

Questions to ask

What should I consider before accepting an invitation to review?

Read the information sent by the journal or publisher. This will typically consist of a title, abstract or summary, the names and affiliations of the authors, and a deadline for the review.

Image by: Pete Fecteau, CC0, via Wikimedia Commons

- **Read this information and assess** if you have the required knowledge and expertise to review the work reported.

- **Check the deadline:** Can you realistically provide a review by this date?

- **Check the authors and their affiliations:** do you know any of the authors professionally or personally? Are you an active competitor or collaborator of any of the authors? If you are, this constitutes a competing interest (see Unit 1) and you should decline to review.

- **Check the publication's name.** Is it a legitimate publication that you know and recognise? And are you familiar with its peer review guidelines and criteria for publication?

- **Do you understand and accept** the requirements of the publication's peer review model?

For more guidance, see *COPE's guidelines on what to consider when asked to review*.

What should I consider while reviewing?

This will vary by academic discipline and publication type but can often include:

- Is the research question and/or the rationale for the work clear?

- Are the approaches used appropriate for the question addressed?

- Is the existing literature cited appropriately?

- Is ethical approval reported for work involving humans or animals?

- Is there evidence of scientific fraud or major flaws or poor practice?

- Is the work and its findings reported in enough detail to understand what was done and found, and/or to verify or reproduce the reported findings?

- What is the quality of the reported work overall and are there specific concerns relating to data quality?

For more guidance, see PLOS guidelines: How to Write a Peer Review and Wiley guidelines: How to peer review a journal article manuscript.

Further training and resources

At the University of Edinburgh - General

Research misconduct policy

Conflict of interest policy

Elsewhere - General

COPE: Ethical Guidelines for Peer Reviewers (2017)

COPE: Guidelines on what to consider when asked to review (2019)

Elsevier Researcher Academy: Online peer review training modules

EQUATOR network: Peer review training and resources

How to add reviewing activity to your ORCID record

UKRIO Code of Practice for Research: Peer review

Elsewhere - STEM

EMBL-EBI training webinar: The future of preprint review

PLOS guidelines: How to Write a Peer Review

Sense About Science: The nuts and bolts of peer review

Web of Science Peer Review online courses (requires enrolment)

Wiley: How to peer review a journal article manuscript

Elsewhere - AHSS

Arts and Humanities Research Council Peer Review Resources

AU Presses Handbook for Monograph Publishing: Best Practices in Peer Review

Wiley: How to peer review a book manuscript

Unit 4. Reporting Research Outputs: principles and good practice

In Unit 4, you will explore:

- who has expectations regarding the reporting of research outputs;

- key points to remember for different research reporting formats and research disciplines;

- how to report research outputs;

- general research output reporting requirements;

- research output reporting requirements for studies involving humans and animals;

- how to find discipline specific research output reporting policies;

- how to meet research output reporting requirements relevant to your work.

Who has expectations regarding the reporting of research outputs?

Those involved in the evaluation, funding, approval, planning, execution, analysis, preparation and reporting of research. In addition, those who participate in research and have an interest in what is reported.

This includes:

- Research funders;

- Universities, research institutes and companies;

- Researchers who generate and utilise research outputs;

- Assessors of research submitted for funding or publication (including peer reviewers, and journal editors);

- Online repositories for research outputs, journals, and publishers;

- Research participants and wider society (including governments, policy makers and the public).

Image CC-BY Created by DinosoftLab from NounProject.com

Why do they have expectations regarding the reporting of research outputs?

Research funders: Are accountable for the quality of the research they fund. They want to maximise the impact of this research and its benefits for the scientific community and for society as a whole.

> **Did you know?** UKRI funded research outcomes are made publicly available for the purposes of transparency and knowledge sharing on UKRI's Gateway to Research.

Universities, research institutes and companies: Are accountable for the quality and integrity of the research they fund directly and/or is conducted by their staff and students. They are also required to support researchers to fulfil research funder policies and expectations concerning open research (see Unit 5), plus the correct reporting and dissemination of research outputs.

Researchers: Are accountable for the quality of research outputs being reported and for making them available according to funder policies and journal requirements. This requires research to be rigorously planned, conducted, analysed, reported and disseminated in accordance with best practice.

Peer reviewers: Are accountable for checking research outputs are reported in accordance with good research reporting practices and are accessible in accordance with community or journal requirements.

Online research repositories: Are accountable for ensuring that research is accessible and in a format that enables its reuse.

Journal editors and publishers: Are accountable for the integrity of scholarly publications and expect scholars to comply with their policies. Their intention is to support and promote best practice in the publication of research outputs.

Research participants and wider society:
- Hold research funders accountable for the quality and integrity of the research they fund.

- Hold universities, research institutes and companies accountable for the ethical review, approval and conduct of research on their premises, or by their staff and students.

- Expect journals and publishers to be responsible for the quality and integrity of published research outputs, and to correct the published record as and when they are required to.

Research outputs and outcomes

Research outputs come in a huge variety of formats

Sometimes the terms **research outputs** and **research outcomes** are used interchangeably.

Research Outputs generally include: dissertations, theses, publications, exhibitions, new research tools or methods.

Research Outcomes generally include: new or improved products, processes or public policies.

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Within STEM disciplines this commonly includes (but is not limited to):

- Data (quantitative and qualitative)

- Code, software

- Protocols, methodologies, technique manuals

- Digital images and recordings (video, sound and animations)

- Novel reagents, cell lines, and genetically modified organisms

- Conference proceedings, abstracts

- Publications (articles and books) and preprints

- New technologies (devices, equipment, tools, patents)

Within AHSS disciplines this commonly includes (but is not limited to):

- Data (quantitative and qualitative)

- Publications (articles and books)

- Preprints

- Interviews, meeting notes, transcripts

- Digitised resources (books, paintings, objects)

- Protocols, methodologies, technique manuals

- Archives, catalogues or collections

- Monographs, books or book chapters

- Text corpus/corpora

- Exhibitions and/or public engagement material

Not all research output formats are covered by reporting requirements

In general, research output reporting requirements apply to:

- Peer-reviewed research articles, including reviews and conference papers, that are accepted for final publication. This can be in a journal, conference proceeding with an International Standards Serial Number (ISSN), or on a publishing platform.

- Academic monographs, book chapters bearing an International Standard Book Number (ISBN), including chapters in academic books and edited collections arising from conferences.

In general, research output reporting requirements do not apply to:

- Trade books

- Scholarly editions

- Exhibition catalogues and scholarly illustrated catalogues

- Textbooks

- All types of fictional works and creative writing

University research output reporting requirements

The University 'Strongly encourage researchers to make monographs, scholarly editions, textbooks, book chapters, collections of essays, datasets, or other outputs that are not scholarly articles as openly available as possible.' (Research publications & copyright policy 2021)

To support researchers to fulfil this expectation the University of Edinburgh provides free-at-point-of-use:

- DataShare - a digital repository for research data that can be used by researchers and research students.

- PURE – an information management system that research staff can use to upload publications (including manuscripts, book chapters and monographs) to make their research publicly accessible via Edinburgh Research Explorer, the University's online portal.

Reporting Research Outputs using ResearchFish

Reporting research outputs

Many research organisations require grant, fellowship or studentship holders to report research outcomes through a service called **Researchfish**.

This includes the Wellcome Trust and UKRI research councils (except Innovate UK).

Please refer to this list of Researchfish community members list to check for other research funders.

General points to remember:

- **If you are a principal investigator or fellow**, you will usually need to report outcomes from early in your project until at least five years after it ends.

- **If you are a doctoral student** with a studentship you will usually need to report outcomes from the third year of your studentship and for three years after it ends.

- **You must submit your research outcomes during the annual submission period.** This is unless you have an exemption or have been told to use alternative reporting methods. The submission period is usually six weeks between February and March each year.

Note - these reporting requirements are not based on the college you are linked to but on who funds your research.

Key points to remember:

- What you need to report will depend on the output or outcome type.

- You may also be asked to record:

    - patents and other intellectual property you apply to protect;

    - spinout companies you set up as a result of your research;

    - collaborative work with industrial or academic partners;

    - how your work has contributed to public policy development;

    - how the public have been informed about or involved in your work.

NOTE - If you receive funding from EPSRC, there may be different rules for reporting outcomes – depending on the type of grant you receive. See Reporting outcomes for EPSRC-funded projects.

Research Output Reporting Requirements

General research output reporting requirements

Many research output reporting policies currently require that:

Image CC-BY Created by Muhammad Atiq from NounProject.com

- All outputs from research are made available with as few restrictions as possible and in accordance with the FAIR Principles (discussed in Unit 5) as soon as possible. The exact timescale for sharing can vary by subject and discipline. It might also reflect the resources available to support this.

- The generation and sharing of research outputs conforms with all relevant ethical, legal and regulatory obligations (see Unit 1 for more). When this involves research conducted outside of the UK, relevant national legislative requirements should be followed.

- Research is reported in accordance with relevant discipline and journal specific requirements.

- Persistent Identifiers (PIDs) for articles are implemented, according to international recognised standards. Examples of PIDs include Digital Object Identifiers (DOIs), Archival Resource Keys (ARKs) and Uniform Resource Name, Identifier or Location (URN/ URI / URL). Research Resource Identifiers (RRIDs) are also used when reporting reagents and tools.
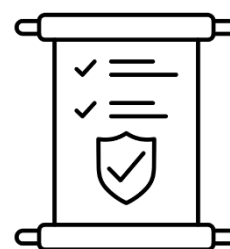
- The funding source is acknowledged. The inclusion of common unique PIDs for research management information (for example, identifiers for funders and/or organisations) is also strongly encouraged.

- The Open Researcher and Contributor ID (ORCID) identifier is used to identify all authors and contributors

Important changes to general research output reporting policy requirements

From the 1st April 2022 UK research funders will:

- Require **immediate open access** for peer-reviewed research articles submitted for publication;

- Require research articles to **include a Data Access Statement**, even where there are no data associated with the article or the data are inaccessible;

- Strongly encourage the adoption of metadata standards and persistent identifiers for longform research outputs.

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NounProject.com

From the 1st January 2024 UK research funders will:

- Require **immediate open access** for published monographs, book chapters and edited collections.

- Require monographs, book chapters and edited collections **to include a Data Access Statement**, even where there are no data associated with the article or the data are inaccessible.

- Strongly encourage the adoption of metadata standards and persistent identifiers for longform research outputs.

Source: UKRI Open Access Policy

What is a data access statement?

A data access statement (aka data availability statement) simply explains how underlying research materials can be accessed.

It is intended to enhance clarity and transparency regarding access to the data that underpins the work, its source and any access conditions.

Example data access statements:

- The following materials which support this work are available for public access: [insert data citation(s) here*]

- The research materials supporting this work can be accessed by contact [insert contact details here].

- Due to the confidential nature of some of the research materials supporting this work, not all of the data can be made accessible. Please contact [insert contact details here] for more information.

- This work is entirely theoretical, there is no data underpinning it.

Policies on reporting research outputs that involve human subjects

Key points to remember:

- Findings must be made accessible, with adequate consent and privacy safeguards, in a timely manner (within 1 year of completion).

- Information about research findings must be made available to those who took part in the study, to interested groups or communities and to the general public in a format that is accessible and easy to understand, unless otherwise justified (UK Policy Framework for Health and Social Care Research).

Policies on reporting research outputs that involve human subjects: clinical trials

Key points to remember:

- If your study is a Clinical Trial of an Investigational Medicinal Product (CTIMP), designed to assess the efficacy of a healthcare intervention, results must be uploaded to the EudraCT database. This must be within 12 months of the 'end of trial' or within 6 months of the 'end of trial' for paediatric studies.

- The International Committee of Medical Journal Editors' (ICMJE) considers randomised clinical trials for publication only if pre-registered in an appropriate registry (ACCORD).

- The Edinburgh Clinical Trials Unit (ECTU) can support the sharing of anonymous study data for secondary use.

Policies on reporting research outputs that involve the use of animals
Responsibility in the use of animals in bioscience research

This document sets out the expectations for research funded by the Association of Medical Research Charities (AMRC), including CR-UK, BBSRC, DEFRA, EPSRC, MRC, NC3Rs, NERC, The Royal Society and the Wellcome Trust.

Key points to remember:

Researchers should ensure that they report animal-based studies in accordance with the ARRIVE guidelines. They must also consider the specific editorial policies of the journal concerned.

Where possible, grant holders and staff should include in their published papers information that might help others implement the 3Rs in similar experiments. This information should also be included when reporting research outcomes.

Policies on reporting biomedical research outputs
Key points to remember:

Biomedical research articles that acknowledge Wellcome Trust, MRC or BBSRC funding are required to be made freely available through PubMed Central (PMC) and Europe PMC by the official final publication date.

> **NOTE** – research articles are deposited directly into PMC by the publisher. For articles funded wholly or in part by a Europe PMC funder this user guide provides submission guidance.

Additional sources of research output policies that you may be expected to adhere to
These can include:

- **Journal or publisher requirements:** as explained under Reporting requirements, Publication ethics' policies, Editorial policies and/or Author checklists.

- **Discipline-specific reporting standards:** examples include CARE for case reports, CONSORT for clinical trials, STROBE for observational studies, COREQ for qualitative research, ARRIVE for animal studies. Many journals and publishers incorporate these standards into their policies.

- **Repository, archive, or database service providers:** which often have requirements explained under Submission instructions and/or Reporting requirements.

> **NOTE** – if you have research outputs generated as part of a collaboration, your outputs may be subject to policies linked to your co-authors.

Questions to ask

How do I find out what research outcome reporting requirements are relevant to me?

You can search for research output reporting policies using:

FAIRSharing.org – A cross disciplinary registry of data preservation, management and sharing policies from international funding agencies, regulators, journals and other organisations.

> **Did you know?** FAIRSharing.org contains over 90 different subject areas from across the arts, humanities, social sciences, science, engineering, medicine and veterinary medicine disciplines.

Image by: Pete Fecteau, CC0, via Wikimedia Commons

EQUATOR network - An international health research initiative promoting the wider use of robust reporting guidelines.

MERIDIAN – A one stop shop for reporting guidelines that address a variety of animal research purposes, species and techniques.

How can I meet the relevant requirements for reporting my research outcomes?

1. **Familiarize** yourself with the requirements relevant to your scholarly research.

2. **Review** your current approach and identify opportunities for improvement.

3. **Reflect** upon how you could design and plan your research to better fulfil these requirements. You may need to:

   • register your trial, study or protocol with a recognized registry before starting your research;

   • revise your research design to include measures to minimise sources of bias;

   • review your methodology to improve reproducibility and clarify your approach;

   • pre-specify inclusion and exclusion criteria;

   • identify an appropriate repository, database or archive to store your research materials long term.

4. **Write** a list, or plan of action and work to implement one item at a time.

5. **Request** or apply for additional training, resources or support you may need to help you implement change.

Further training and resources

At the University of Edinburgh - General

Research Publications and Copyright policy

Key Funder Policies

Research Data Management Policy

Elsewhere - General

UKRI Open Access Policy

Go FAIR – FAIR Principles

ResearchFish User Guide

At the University of Edinburgh - STEM

ACCORD – Registration and Reporting

Clinical Research Support

Elsewhere - STEM

NHS HRA Best Practice in the Publication and dissemination of research findings

ARRIVE Guidelines

EQUATOR Network

At the University of Edinburgh - AHSS

CAHSS Open Access

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Reporting on Humanities-Orientated Research in education

Reporting on Empirical Social Science Research in education

Unit 5. Open Research and IP: principles and good practice

In Unit 5, you will explore:

- what is open research?

- the benefits of open research;

- open research policy requirements;

- open access;

- data sharing;

- open source software and code;

- common concerns relating to open research;

- examples of open research resources for sharing research outputs.

What is open research?

*"**Open research** describes a range of practices relating to the conduct of research and communication of its outputs. By improving access to research outputs according to best practices that enable research to be **findable, accessible, interoperable** and **re-useable (FAIR principles)** researchers have more opportunity to engage, replicate and accelerate knowledge discoveries and to benefit society and the economy."*

"It has strong links with policies in other areas such as research integrity, research culture, digital infrastructure, talent and skills and research ethics."

Source: UKRI Open Research Resources hub.

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from
NounProject.com

The general principle is to be **as open as possible** and as **closed as necessary**.

Who has an interest in open research?

Those involved in the evaluation, funding, approval, planning, execution, analysis, and reporting of research. Those who participate in research also have an interest in what is openly shared.

This includes:

- Research funders
- Universities and research institutes
- Researchers wishing to utilise research outputs
- Open research repositories and online resources
- Journal editors and publishers
- Research participants
- Wider society (including governments, policy makers and the public)

What are the benefits of open research?

Greater returns on investment for research funders and researchers by maximising the re-use of research to amplify its social, economic and scholarly benefits.

Improving transparency to allow greater scrutiny of research methods, evidence and interpretation of findings.

Enhancing the replicability and reproducibility of research and validation of research methods.

Increasing the impact and visibility of research, whilst gaining credit for citable research outputs.

Promoting innovation and stimulating future research by developing new collaborations with other research users and creators.

Reducing costs by not duplicating existing research.

Providing resources for education, training, public engagement and Knowledge Exchange.

What does open research include?

Open research includes:

- **Open access** – the process of publishing research as digital, online, free to read, plus free to reuse and share;

- **Data sharing** – the process of making research data available for wider dissemination;

- **Open source software** (OSS) – software for which the source code is openly licensed and available for scrutiny, adaption and reuse;

- **Open code** – code or software scripts that are openly licensed and available for scrutiny, adaption and reuse to help others reproduce research results.

General open research policy requirements

Many open research policies require:

- **outputs from publicly-funded research to be made freely accessible** as soon as possible;

- **that publications and research data are made open access**, irrespective of whether the research is publicly funded or not;

- **the sharing of research outputs** whilst conforming to all relevant ethical and legal obligations;

- scholars to act in a manner that considers public value for money and affordability.

Open Access

Watch this **short video on Open access** to find out what it is (SHB Online, CC BY license, runtime 5:01)

University policies relating to open access

There are three policies that outline the university expectations relating to **open access** practices of staff and students.

- The Research Publications and Copyright policy.

- The policy on Intellectual Property commercialisation.

- The policy on Student intellectual property rights.

The university Research Publications and Copyright policy states that *'members of staff own the copyright to their scholarly works'*.

This policy applies to all scholarly articles, including conference proceedings, authored or co-authored while the person is a university staff member.

This policy does not apply to monographs, scholarly editions, textbooks, book chapters, collections of essays, datasets, or other outputs that are not scholarly articles. However, the university strongly encourages researchers to make these as openly available as possible.

> **Note** – this policy came into full effect on the **1st January 2022** and complies with all UK research funder requirements.

University open access policy requirements

Key points

- Upon acceptance for publication each staff member with responsibility for research must grant the university *'a non-exclusive, irrevocable, worldwide licence to make manuscripts of their scholarly articles publicly available under the terms of a Creative Commons Attribution (CC BY) licence, or a more permissive licence.'*

- After granting the licence, each staff member with responsibility for research must provide an electronic copy of the accepted manuscript to an appropriate representative of the university. This must be in an appropriate format and free of charge.

- The university will deposit the accepted manuscript in a digital repository (PURE) along with article metadata and make this available under a Creative Commons Attribution (CC BY) licence.

How to make your scholarly publications open access

1. Select an open access journal or publisher that aligns with the university open access policy requirements.

2. Check whether your work will be subject to an article processing fee (APC) and if so, how you will pay for this. You may:

   - have access to discounted APCs via publisher open access agreements through the university library;

   - have funding to cover the cost of APCs already included within your grant;

   - be able to apply for an open access funding grant or be eligible to apply for the university to pay your APC costs.

3. Decide what open access publication route you want to take:

- **Gold route** – pay an APC to the journal or publisher to make the article free to read at the point of publication. You will still need to grant the university a licence and provide a copy for deposition in its digital repository (PURE).

- **Green route** – the original article will not be made open access by the journal or publisher, but you can make a free copy available via the university digital repository (PURE) after publication. You will need to grant the university a licence and provide a copy for deposition.

- **Publish yourself** – this involves making your work freely available to read and cite by assigning a creative commons license to control how others can used it.

University policies relating to open access

The policy on Intellectual Property commercialisation applies to:

- all university employees;

- intellectual property (IP) that is of potential industrial or commercial interest only.

It does not apply to:

- creative work defined as *'teaching materials, books or learned articles, artistic or musical works, sound recordings, films or broadcasts, works protected by design right, trademarks'*; or

- students.

For further advice and support contact Edinburgh Innovations

The policy on Student intellectual property rights applies to students only.

- It states that *'the student should retain ownership of Student IPRs except where there is a specific requirement for the University to take ownership'.*

  Examples include when:

  – the grant funding terms require the university to own the student IPRs e.g. Marie-Curie EST Scheme, CR-UK funding;

  – the studentship is a CASE or other form of collaborative studentship with an industrial party that requires the university to own the Student IPRs to grant licences/options to the industrial party;

– the studentship forms part of a larger project within the university with funding that requires the university to own all IPRs;

– the university needs to own the Student IPRs to apply for patent protection, or for some other commercialisation reason.

Data Sharing

Watch this **short video on Data sharing** to learn what it is (UK Reproducibility Network, CC BY license, Runtime 3:09)

FAIR principles

The FAIR guiding principles for scientific data management and stewardship were developed to ensure that scholarly outputs are:

Findable – metadata and data must be easy for humans and computers to locate.

Accessible – once the user finds the required data, there must be clear instructions on how it can be accessed, possibly including authentication and authorisation.

Interoperable – the data must be in a format that is compatible with other research outputs, tools or software. This is so that it can be analysed, stored or processed with other data.

Reusable – the metadata and data must be appropriately described so that other scholars can replicate or combine it in different ways for future research.

> **NOTE** - There are specific challenges that must be overcome when sharing 'personal data'.

What is 'personal data'?

'Personal data' is defined in law as "*any information relating to an identified or identifiable natural person.*"

An 'identifiable person' is "*one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person*".

Source: GDPR Resources and Information

Challenges when sharing 'personal data'

Data protection laws

- There are several laws that govern the processing of **personal data**, including:

    – the common law of confidentiality

    – general data protection regulation (GDPR) and the data protection act

    – section 251 of the National Health Service act

- These do not apply to anonymised data and there are also some exemptions for scientific studies.

Consent

- You must ensure that participant consent forms state what data will be stored, how it will be managed, how it is likely to be used in the long-term, and how confidentiality will be protected.

Anonymisation

- Beware, some seemingly anonymised data can be re-identified. For more information see How individuals can be indirectly identified.

- The Information Commissioners Office (ICO) has published this Anonymization Code of Practice.

Data sharing in practice

How to share your data

- It is important to be aware that each field of research will have its own conventions, challenges and solutions so there is no 'one size fits all' approach.

- Find an appropriate repository for your dataset, preferably one that will give you a digital object identifier (DOI) or another persistent identifier. You can use the Registry of Research Data Repositories.

> **Did you know?** There are currently over 120 arts data repositories, as well as over 200 veterinary, 400 social science, 600 engineering, 850 medical and 1000 humanities data repositories!

- Ensure all data and metadata meets good practice standards to facilitate long-term use and integration. You can view a list of standards on the Data Curation Centre's (DCC) website.

General recommendations for making data complete and useable:

- Use clear and detailed data descriptions and metadata to increase future reuse.

- Whenever possible, make data accessible independent of publications.

- Ensure data exclusions, or missing data are clearly identified.

- Provide access to raw/unprocessed data whenever possible, ideally together with the analysis code or processing scripts.

- Whenever possible, convert proprietary formats/file types (that require specific software to open) to open or standard formats before storing.

- Provide guidance on how your data can be reused and how you would like the dataset cited.

- Review the data submission for quality control, especially if the data is not peer reviewed.

Source: Data Sharing: a primer from the UK Reproducibility Network

Open Source Software (OSS) and Code

What is open source?

Open source refers to software source code and other code that is published publicly and 'openly licensed'.

Open licences provide permission to freely use copyright works under the terms and conditions set by the licence. The most common example is a Creative Commons Licences.

Image CC-BY
Created by Juicy
Fish from
NounProject.com

Thus **open source** refers to software source code and other code that anyone can see, use, or modify for their needs.

Open source can also include workflows or scripts that instruct software to process data in a particular automated way.

Source: Open Code and Software: a primer from the UK Reproducibility Network

Why make software and code open source?

For the same beneficial reasons as for **open access** and **data sharing**:

- to encourage collaboration and enable community working to solve a problem;

- to support innovation by improving the functionality, usability and applicability of software or code;

- to improve reproducibility by enhancing repeatability and enabling the testing the replicability of workflows on a larger scale.

General recommendations for making software and code open source:

- Name your code and choose an open source initiative approved license for it.

- Decide how to version control it. Code can be versioned with a single number (e.g., Version 1) and possibly a date. For software, semantic versioning is recommended.

- Choose where and how you want to make it available. Two commonly used resources are:

   - GitHub - a code-hosting platform for version control and collaboration with free and paid for content.

   - Zenodo - a general purpose open access repository where you can archive GitHub projects and create DOIs for them.

- Create a README text file containing some descriptive metadata about the code.

   This might include a short description of:

   - what the code is;

   - details of who has written/contributed to it;

   - who has resourced the development of it:

   - how you want others to communicate with you about the code.

Source: Open Code and Software: a primer from the UK Reproducibility Network

The university has created this templateREADME file you can use.

Common concerns relating to open research

Finding mistakes

- We are all human and sometimes genuine mistakes do happen. **Open research** can help to ensure that these errors are identified and corrected without damaging your work or career.

Being scooped

- By using **open research** repositories that assign a persistent identifier to your work, you will ensure that you are acknowledged when others use or cite your work.

- Many repositories will also allow you to *embargo* the release of information (including data and protocols) for a limited time.

Increased accountability

- All scholars are expected to act in a manner that delivers public value for money and conform to relevant ethical and legal obligations. **Open research** is a great way to demonstrate this.

Time burden

- As with anything new, it can take time to learn how to format, deposit, archive and check **open research** outputs. This requires an upfront investment in time, but there is lots of advice, help and support out there.

Questions to ask

How can I make my STEM research outputs open access?
Examples of STEM relevant open access resources include:

- Protocols.io and Protocol Exchange for sharing research protocols.

- The Open Science Framework (OSF), Figshare and Zenodo are general-purpose open-access repositories.

- Specialist data repositories such as DataCite and Dryad provide a persistent identifier (DOI) for data and metadata.

- Open Lab Notebooks provides a platform for scientists to share their laboratory notebooks live online.

- Other specialist registries include; cell line repositories such as NIGMS, and the Antibody Registry for antibodies described in publications.

- IMPC for gene and mouse phenotyping data.

- ChEMBL – for chemical, bioactivity and genomic data.

- HEPData – for publication related High-Energy Physics data.

- ThermoML – for thermophysical and thermochemical property data.

- NetLib – for mathematical software, papers, and databases.

- HepSim – for Monte Carlo simulations for particle physics

To search a full list of open research data repositories you can visit www.re3data.org or read this data repository guidance.

How can I make my AHSS research outputs open access?
Examples of AHSS relevant open access resources include:

- Open Library of Humanities

- SSOAR – Social Science Open Access Repository

- NOAA – Environment data hosted by the National Centers for Environmental Information

- PANGAEA – data repository for earth and environmental science

- EarthChem – for geochemical, geochronological, and petrological data

- WDC Climate – for climate and earth system data

- Archaeology Data Service – for heritage data

- SUITS – for urban mobility data collections.

To search a full list of open research data repositories you can visit www.re3data.org or read this data repository guidance.

What potential challenges might open access raise for me and how can I manage them?

Anonymization

- Work with anonymized data whenever possible by removing direct and indirect identifiers from quantitative and qualitative data.

- Consider what consents you may need and anonymization procedures as early as possible during the planning stage of your project.

- If data cannot be completely anonymized, you should consider how you will manage access instead.

Data access

- Decide in advance who might require access to what subsets of data. For example, it may not be necessary or appropriate for all individuals to have access to sensitive, safeguarding or shielding subsets of data.

- If using a large data repository, consider managing access using an end user license.

Further training and resources

Links to open research further training and resources – General

At the University of Edinburgh

Research Publications and Copyright policy

Policy on Intellectual Property

Key Funder Policies

Research Data Management Policy

Elsewhere

UKRI Open Access Policy

Go FAIR – FAIR Principles

Concordat on open research

opensciencemooc.eu – free online training on all aspects of open research

[Best Practice in the Publication and dissemination of research findings](#) – NHS HRA

Links to open access further training and resources – General

At the University of Edinburgh

[Making your research open access](#)

[Edinburgh Research Explorer](#)

[College and school open access contacts](#)

[Open.Ed How To Guides](#)

Elsewhere

[Sherpa Romeo](#) – online resource containing publisher copyright and open access policies

[Open Access: a primer from the UK Reproducibility Network](#)

[UKRI Open Research Resources](#)

[DOAJ](#) – Directory of Open Access Journals

[OpenDOAR](#) – global Open Directory of Open Access Repositories

[OASPA](#) – Open Access Scholarly Publishing Association resources

[TOP Guidelines](#) – the Transparency and Openness Promotion guidelines contain eight standards to move scientific communication towards greater openness.

Links to data sharing further training and resources – General

At the University of Edinburgh

[MANTRA](#) – online research data management training

[Research Data Management Policy](#)

[Research data service](#)

Elsewhere

[Data Sharing: a primer from the UK Reproducibility Network](#)

[How to License Research Data](#) Alex Ball (2014) DCC How-to Guides.

UK Data Service learning hub on research data management

UKRIO guidance note on internet-mediated research

GDPR and Research – UKRI advice for researchers

Caldicott Principles – guidance on sharing medical data

Links to open source software and code further training and resources – General

At the University of Edinburgh

Software Licensing, Open Source and Sharing Your Code

Elsewhere

Open Code and Software: a primer from the UK Reproducibility Network

OpenUK – promoting open technology

The R Project - a free software environment for statistical computing and graphics

Ten simple rules on writing clean and reliable open-source scientific software

Links to open research further training and resources – STEM

At the University of Edinburgh

ACCORD – Registration and Reporting

CMVM Core Facilities Fair Publication Policy

CMVM Public Engagement with Research

CSE Public Engagement

Links to open research further training and resources – AHSS

At the University of Edinburgh

ACCORD – Registration and Reporting

CAHSS Open Access

CAHSS Research Ethics and Data Protection Briefing Note

Elsewhere

UK Data Archive - the UK's largest collection of social, economic and population data

Unit 6. Misrepresentation and distortion of the scholarly record

In Unit 6, you will explore:

- the differences between poor reporting practices and misconduct;

- how bias can distort the scholarly record;

- the consequences of misrepresentation;

- common examples of spin within publications;

- what to look out for within the scholarly record.

What does this unit cover?

Formal written publications (published online or in print) are a common output of academic work (both STEM and AHSS).

They provide the opportunity for scholarly work to be assessed (via peer review), communicated and shared.

This formally published record also provides an evidence base for future work.

Because of this, we all have a shared responsibility to maintain the integrity of the published record.

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Created by Adrien
Coquet from
NounProject.com

> **The aim of this unit** is to highlight common poor reporting practices within formal publications to minimise the risk of inadvertently committing <u>research misconduct</u>.

Why does this matter?

- Not all research outputs are formally published, or peer reviewed. Only peer reviewed publications are routinely checked to ensure they meet the standards and policies discussed in units 1-5.

- All research requires a solid evidence base or clear explanation irrespective of the research purpose:

    - to test a hypothesis or to investigate a research question;

- – to inform the development of a hypothesis, methodology, approach or technique;

- – to explore meaning, interpretation or definition.

- Academic freedom means that scholars have a level of autonomy over how they present, interpret, discuss and share their work. Peer review provides an opportunity to challenge how facts and findings are presented, interpreted and discussed. However, best practice often remains a matter of opinion and the subject of fierce debate.

- Peer review alone cannot address cultural issues. For example, publication bias has arisen because for many years the scholarly community has predominantly published positive or confirmatory results. As a result, negative, null or inconclusive findings are less prevalent in the scholarly record.

Why bias can distort the scholarly record

"Bias is a particular tendency, trend, inclination, feeling or opinion about someone or something, especially one that is preconceived or unreasoned."

Source: (definition of bias from dictionary.com)

"All judgements and decisions rest on the way we see and interpret the world". (Scott Plous)

Cognitive Bias

There are many different types of bias that can influence research results.

Cognitive bias describes systematic errors in our judgement and decision making.

There are five common sources of cognitive bias:

- Confirmation bias

- Action orientated bias

- Self-interest / self serving bias
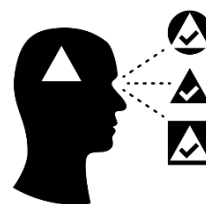
- Over confidence bias

- Status quo bias

Imabe CC-BY Created by Mike Pick from NounProject.com

Source: Beliefs and bias in decision making

1. **Confirmation bias**

   - When scholars seek to collect evidence that supports their hypothesis or model and ignore other evidence.

   > **For example:** It can be common for individuals to design studies to generate evidence to support rather than test their ideas.

   - hypothesis or model. The absence of evidence against your ideas, despite your efforts to disprove them, is what makes your hypothesis or model more likely to be true.

   See Confirmation Bias for more information.

2. **Action orientated bias**

   - When scholars present post-hoc changes as if they were the original intention.

   > **For example:** it is very common for individuals to revise hypotheses or models after their research has been conducted and analysed. Authors might also change, or add new, outcome measures during a study in order to report those of greatest statistical significance.

   - When publishing, it must be made clear to readers when hypotheses have been revised due to a study's findings and whether these hypotheses have been tested or investigated.

   This source of bias includes Outcome Reporting Bias.

3. **Self-interest / Self-serving bias**

   - When scholars handle their findings differently, depending on whether they agree or disagree with the model or hypothesis being investigated.

   > **For example:** findings that go against an investigated model or hypothesis are often scrutinised more than findings that agree with a model or hypothesis. Unexpected or outlying results are also sometimes ignored, or removed from analyses.

   - Appropriately designed studies can address this form of bias. They provide confidence in all findings, irrespective of how they relate to a tested hypothesis or model.

   - Where there are valid reasons to remove results from an analysis, it is good practice to disclose these in advance as inclusion/exclusion criteria.

   This source of bias includes Attrition Bias .

4. **Over confidence bias**

- When scholars do not recognise the limitations in their own beliefs, views, abilities

   > **For example:** some study findings or results rely upon individuals making subjective decisions. These decisions can be biased if those making the decision are aware of the outcome being investigated, or the study group they are observing.

- **Blinding** is a method used to minimise the potential impact of such biases and should be included whenever possible. Commonly this involves individuals being unaware of which group they are working with, or a sample derives from, or what the outcome of interest is.

This source of bias includes Performance Bias and Observer Bias .

5. **Status quo bias**

- When scholars seek to maintain the existing situation and do not consider alternative interpretations or approaches.

- Knowledge, technology and the scholarly record constantly evolve. It is therefore good practice to regularly review:

   – available evidence and interpretations,

   – current approaches and methods,

   – how they might apply to our work.

   > *"The important thing is never to stop questioning."* (Albert Einstein)

The concept of spin within the published record

> **Spin bias is defined as** "*the intentional or unintentional distorted interpretation of research results, unjustifiably suggesting favourable or unfavourable findings that can result in misleading conclusions*"

Spin is often the result of poor practices that can distort the scholarly record without lying.

It arises when authors might actively seek to:

- ensure that readers form a positive impression of their work;

- reduce the risk that readers will form a negative impression of their work.

Good practice, poor practice and misconduct

Good reporting from the start

Publications often start with an introduction to set the context for the work being reported.

The introduction should contain:

- sufficient background information to understand the rationale and context for the study;

- the question, problem or issue being investigated;

- the study purpose and scope, or aims and objectives, plus specific hypothesis (if relevant);

- an explanation of the approach being taken, such that the relevance of the methodology and relevance of the study is clear.

Poor reporting from the start

It is poor practice in the introduction to:

- only reference existing literature or published evidence that supports the study being described if there is also evidence to the contrary. The introduction should provide a balanced overview of the existing knowledge base;

- present hypotheses developed after a study has been completed. This is to avoid readers from inferring that the study was designed to investigate these new hypotheses.

Good reporting of methods or approach

The materials and/or methods section should contain:

- the study design in sufficient detail for others to assess the validity of the reported work;

- the research subject(s) in sufficient detail for others to assess the translational value of the reported work;

- the method(s) used, including research protocols, search criteria and/or terms, materials and/or software, plus details of data collection and analysis. This must be in sufficient detail for others to assess and/or repeat the reported work;

- any pre-determined inclusion/exclusion criteria for the data or findings being analyzed;

- a description of the ethical and/or legal approvals required for the work undertaken.

Poor reporting of methods or approach

It is poor practice within the materials and/or methods section to:

- omit or fail to provide sufficient information to enable the work to be repeated, or for its validity or translation value to be assessed;

- cite existing literature describing study methods and/or protocols without detailing modifications;

- change the study objectives, or hypothesis. For example, adjusting initial objectives or hypotheses to more closely match modifications made post-analysis;

- change the outcome measures and/or methods of analysis. These may change as a study progresses, but this should be reported;

- omit to mention any deviations, or modifications to the described protocols and/or methods.

> **It is misconduct to** deliberately alter the information provided with the intention of falsely appearing to comply with good practice standards, or to satisfy reviewer comments.

Good reporting of results and findings

The results section should include (if appropriate):

- a written summary and/or visual representation of findings and/or descriptive statistics for each analysis conducted including a measure of variability;

- the outcome measures being assessed and whether they are direct, or indirect;

- details of the statistical methods and tests used to determine significance for each analysis;

- the effect size, with a confidence interval (if applicable).

The results section should describe (if appropriate):

- all research findings and the evidence underpinning them;

- details of the unit of study being compared. This could include sites, groups, participants, events or other units;

- how the units being studied were assigned to research groups (including controls) and the sample size of each;

- measures against bias, for example, randomization, blinding;

- any measures to account for potential confounding factors and/or uncontrolled variables within the analyses;

- whether the data or findings meet the assumptions of the statistical approach.

Poor reporting of results and findings

It is poor practice within the results section (if applicable) to:

- report a 'representative' selection of results, evidence or findings. This contributes to publication bias;

- fail to report outcomes, evidence or findings that do not support, or contradict, the study objectives or hypotheses;

- 'cherry pick', remove outlying data points or evidence from the analysis, unless there are pre-determined inclusion/exclusion criteria to validate this;

- fail to report when and why results, evidence or findings have been excluded from the analysis;

- change the method of statistical analysis (known as p-hacking, data dredging, or significance chasing);

- misinterpret, manipulate or misrepresent p-values.

- present numbers in summary and/or descriptive statistics without units and/or a measure of precision unless nondimensionalization is reported;

- ignore regression to the mean effects;

- plot data on graphs for comparison that are not comparable or should not be compared;

- use different starting numbers and/or different scales for each axis on a graph;

- use bar charts to illustrate non-counted values. Histograms or other more accurate data visualisation methods should be used instead (see kick the bar chart habit);

- not provide a link to the raw data, saved searches, or details of how these can be accessed and under what conditions.

Good reporting of images, data and evidence

It is good practice to:

- keep an original copy of your image, evidence and/or raw data;

- record the equipment and software settings used to collect, analyze and save images and/or data;

- record the source of all evidence and the date collected;

- archive data files in accordance with a data management plan.

> **NOTE -** The university Research Data Management Policy requires researchers to create a data management plan (DMP) at the time of their research proposal if any research data are to be collected or used.

It is acceptable (if applicable) to:

- reduce the number of pixels in an image;

- adjust brightness, contrast or color balance

    - if it is applied to the whole image,

    - and does not alter the visible information,

    - and there is a note in the legend and/or in the materials detailing the specific electronic manipulations made.

Poor reporting of images

It is not acceptable to:

- digitally manipulate an image to clean up the background, or to obscure or eliminate information;

- use duplicate images to represent the results of different experiments (such as images of study controls);

- splice images together, for example:

    - adding or deleting items from a field of view;

    - juxtaposing different items to appear as if originally one image.

Source: What's in a picture?

Misconduct in the reporting of images

> **It is research misconduct to** present findings in figures or images that misrepresent the data.
>
> Showing a figure in which part of the image was either selectively altered or reconstructed to show something that did not originally exist can represent **falsification** or **fabrication**.

Good reporting to the end

Publications often end with a discussion, evaluation and/or conclusions section, in which authors interpret their results or findings and/or reflect on its meaning or the insights gained.

This section should contain (if applicable):

- an explanation of the study results or findings in terms of the study objectives or hypotheses being tested and existing literature;

- an explanation of changes to the study objectives or hypotheses following analysis of the study results or findings (post-hoc objectives or hypotheses);

- study limitations, any imprecision in the data or findings and potential sources of bias not addressed within the experimental or study design;

- practical or procedural lessons learnt whilst the study was being conducted and recommendations for good practice;

- if not mentioned elsewhere, details of study protocol registration, plus access statements available data or other research materials.

Poor reporting to the end

It is poor practice within this section to:

- include or encourage misleading interpretations of the results/findings. Common examples include:

  - presenting pilot study results as statistically significant and rigorous rather than interesting findings to follow up;

  - ignoring confounding factors;

- over extrapolate and/or over interpret your results to make claims that are not supported by the results or evidence you present in a study;

- ignore or understate study limitations;

- ignore differences between the study findings or results and the objectives or hypotheses being tested, and/or alternative interpretations.

Questions to ask

What should I look out for in scholarly publications?

1. **Catchy headlines.** These can over-simplify the findings or results of a scholarly publication or fail to appropriately reflect what the work describes.

2. **Ethical and funding statement.** All research should include details of how the work was funded. If applicable the name of the committee and/or licencing body that has approved the work should also be given. If this information is not given, justification should be provided

3. **Misinterpreted results and unsupported conclusions.** If it is not clear how the reported findings or results relate to, or support, a study's conclusions, then:

   - results might have been over-extrapolated or misinterpreted;

   - conclusions are not based on the reported facts and so are speculative. This should be made clear.

4. **Correlation or causation.** These are not the same thing. To demonstrate causation requires 3 criteria to be met:

   - the cause must precede the effect in time;

   - the cause and effect must be related;

   - there must be no other plausible alternative explanation for the observation.

5. **Competing interest statement.** If this is absent, then reviewers nor readers know if there are financial, professional or personal factors that inform their perception of the reported work. See Unit 1 for more on competing interests.

6. **Problems with sample size.** The smaller the sample size, the less confident you can be in the results. Check for details of the sample size calculation to assess the validity of the approach and robustness of the results. If the work is a pilot study this must be made clear.

7. **Unrepresentative sample used.** A study sample should be sufficiently representative to allow findings to be generalisable. Care should be taken for example when extrapolating results from:

   - animals to humans, or cell lines to vertebrates;

   - different settings, outcomes, interventions or time points;

- different genders, ages, countries, cultures.

8. **No control group used.** All research should have at least one control group, or explain why no control is needed. Control groups allow researchers to assess causality. They are used to confirm that the finding of interest is as a result of the variable(s) being studied and not resulting from other variables or factor.

9. **No blind testing used.** As mentioned earlier, blinding is a strategy to minimise the impact of cognitive biases. It is good practice therefore to state how blinding was incorporated and at what points during the study.

10. **Numbers that don't add up.** The sample size numbers stated within the material and methods section for each study group or unit should match the n= number given in the results section. If not, this must be explained or may indicate selective reporting.

11. **Insufficient methods.** For studies to be repeatable and for the reproducibility of the work to be assessed, it is essential that the methods section contains sufficient detail.

12. **Non peer reviewed material.** Sometimes studies may reuse or cite material that has not previously been subject to peer review. This must be made clear to the reviewer and/or reader.

Further training and resources

At the University of Edinburgh - General

Beliefs and bias in decision making

Elsewhere - General

Catalogue of bias

Why most research findings are false

Beyond Bar and Line Graphs: Time for a New Data Presentation Paradigm

A rough guide to spotting bad science

What's in a picture? The temptation of image manipulation

At the University of Edinburgh - STEM

[Beliefs and bias in decision making](#)

[Challenging Unconscious Bias](#)

Elsewhere - STEM

[Misrepresentation and distortion of research in biomedical literature](#)

[Ethical guidelines for the appropriate use and manipulation of scientific digital images](#)

[ARRIVE 2.0](#)

[CONSORT statement](#)

Elsewhere - AHSS

[Reporting on Humanities-Orientated Research in education](#)

[Reporting on Empirical Social Science Research in education](#)

Appendix 1: Further training

The [Institute for Academic Development](#) at the University of Edinburgh provides a range of training workshops on areas of good practice that are covered in this guide. These are open to University of Edinburgh staff and students only.

Training for	Workshop link	Unit training is relevant for
Staff	[Academic publishing between Copyright, Creative Commons and Open Access](#)	Unit 1
Staff	[Get that Paper Written and Published](#)	Unit 1
UG, PGT, PGR	[Citing sources and creating bibliographies with Endnote](#)	Unit 1
UG, PGT, PGR	[Citing sources and creating bibliographies with Mendeley](#)	Unit 1
UG, PGT, PGR	[Citing sources and creating bibliographies with Zotero](#)	Unit 1
PGR	[Academic publishing between Copyright, Creative Commons and Open Access (PGR)](#)	Unit 1
PGR	[An Introduction to Academic Publishing](#)	Unit 1
PGR	[Managing a Bibliography in Endnote](#)	Unit 1
PGR	[Writing a Research Paper: School of Biological Sciences](#)	Unit 1
PGR	[Writing an Informatics Research Paper](#)	Unit 1
PGR	[Writing for Publication](#)	Unit 1
PGR, CMVM	[Writing for Publication](#)	Unit 1
PGR, MSc CMVM	[Writing up Science](#)	Unit 1
Staff	[Effective Collaborations](#)	Unit 2
PGR	[Collaborative Writing and Publishing](#)	Unit 2
PGR	[Navigating the Peer Review Process](#)	Unit 3
Staff, CAHSS	[How to Peer-Review Manuscripts for Journals](#)	Unit 3
Staff, CSE, CMVM	[How to Peer-Review Manuscripts for Journals](#)	Unit 3
Staff	[Academic publishing between Copyright, Creative Commons and Open Access](#)	Unit 5
Staff	[An Introduction to Copyright](#)	Unit 5
Staff	[Archiving your research data](#)	Unit 5
Staff	[Realising the Benefits of Good Research Data Management](#)	Unit 5

Staff	Working with Personal and Sensitive Data	Unit 5
Staff	Writing a Data Management Plan for Your Research	Unit 5
PGR	Academic publishing between Copyright, Creative Commons and Open Access	Unit 5
PGR	An Introduction to Copyright	Unit 5
PGR	Archiving your research data	Unit 5
PGR	Realising the Benefits of Good Research Data Management	Unit 5
PGR	Working with Personal and Sensitive Data	Unit 5
PGR, CMVM, CAHSS, CSE	Beginners Guide to Imaging	Unit 6
PGR	Figures, images & visualising information for Research	Unit 6
PGR CAHSS	Is My Writing 'Academic' Enough?	Unit 6
PGR CSE, CMVM	Is My Writing 'Academic' Enough?	Unit 6
PGR	Writing a Research Paper: School of Biological Sciences	Unit 6
PGR	Writing an Informatics Research Paper	Unit 6
PGR	Writing for Publication	Unit 6
PGR CMVM	Writing for Publication	Unit 6
PGR MSc CMVM	Writing up Science	Unit 6

Abbreviations: CAHSS, College of Arts, Humanities & Social Sciences; CMVM, College of Medicine and Veterinary Medicine; CSE, College of Science and Engineering; MSc, Masters Science Research student; PGR, post graduate research student; PGT, Postgraduate taught student; UG, Undergraduate student.