# Open Science at Sagol School of Neuroscience

## Guiding Principles and Best Practices

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TEL AVIV UNIVERSITY

# Best Practices for Sagol School Researchers

**Open Design**
- In writing ethics approval and informed consent forms, consider data sharing and it's implications!
- Consider resource preservation and sharing in budget
- Review relevant open datasets, open-source tools, and biobanks
- Develop a data management plan

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**Preregistration** ★

**Data Collection**
- Document the used SOPs, protocols, blueprints and schematics for sharing
- Collect additional samples meant for future sharing
- Follow FAIR standards to collect rich metadata

**Analysis**
- Separate pre-planned analysis from exploratory research;
- preregistration easily enables this!
- Use open-source software when possible
- Fully share your source code

**Share a Preprint** ★

**Publication and Sharing**
- Share data publicly! Include metadata and use standardized formats and common repositories for your field
- Prefer Open Access Journals and Self-Archive
- Provide guidance for crediting your shared resources

**Impact**
- Use public outreach tools to communicate your research
- Preserve sustainable access to resources
- Use open licenses when possible
- Avoid unnecessary restrictive IP; Enable non-profit research, educational, and humanitarian uses

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# Part 01

# Introduction to Open Science

**Dear reader, please mind:**

This chapter is intended to provide a general explanation of what Open Science is, and parts of it may not be directly relevant to your day-to-day work. Specific and practical recommendations appear in the next chapter of the document (Best Practices), while this section aims to introduce the concept as it appears in the discourse of the scientific community. This introduction is mostly based on UNESCO's recommendations on Open Science (2021).

# Open Science is an approach aimed at removing barriers and enabling the dissemination and use of scientific research outputs in a transparent, accessible, and reproducible manner.

It promotes free and open access to research results and encourages collaboration, verification, and further use by other researchers.

# The four core pillars of Open Science:

## Open Scientific Knowledge

**01**

All research outputs – publications, data, code, and methodology – are made publicly accessible for reuse in alignment with open science principles. This includes open access to scientific articles, research data, analytical code, and more.

## Open Science Infrastructure

**02**

Technological and organizational systems that support the creation, storage, and sharing of open research. Examples include open data repositories, analysis platforms, and open hardware.

## Wider Societal Engagement

**03**

Active collaboration between scientists and societal entities, such as citizen science and community engagement initiatives.

## Dialogue with Diverse Knowledge Systems

**04**

Recognition of diverse knowledge traditions and inclusion of underrepresented researchers and communities in the scientific process.

## One of the main goals of Open Science is to create research that adheres to the FAIR principles:

Data that are Findable, Accessible, Interoperable, and Reusable. When information is organized according to these principles, it remains relevant and available even years after the research has been concluded. Other researchers can replicate the experiments and use the data for new studies. The FAIR principles ensure the long-term and sustainable impact of scientific research.

# Why is this Important? Challenges in Contemporary Science

## The Replication Crisis and Lack of Transparencywledge

For the last few decades, science is facing the replication crisis: a significant portion of research findings fail to replicate when other researchers attempt to repeat the experiment under seemingly identical conditions. In other words, the results reported in the original study cannot be reproduced.

This situation undermines the credibility and validity of scientific knowledge and raises fundamental questions about the way academic research is conducted today. Some of the challenges in research relate, among other things, to the incentives for publication in the academic system and to inherent biases such as publication bias, misuse of statistical tools (p-hacking), and a lack of methodological transparency, which hinders replication and scientific scrutiny.

## The "Publish or Perish" Culture

The academic publishing industry and the difficulty in measuring the quality of scientific work have led to a problematic "publish or perish" culture, in which academic success is measured primarily by the number of publications in prestigious journals. This culture encourages researchers to prioritize novel and positive findings over studies with null results or replications of previous research, even though the latter are equally important for scientific progress. This contributes to a systemic bias (known as publication bias or the file-drawer problem) for the publication of positive results only and an avoidance of publishing failures or repeated experiments, directly contributing to the replication crisis.

As a side effect, the culture that pushes publications at any cost to advance in the scientific world serves as fertile ground for predatory journals.

In addition, pressure to publish quickly increases the risk of methodological errors and heightens the temptation to manipulate data. Thus, instead of rewarding research excellence and scientific rigor, at large, incentives in academia seem to prioritize quantity over quality. This culture discourages data and method sharing, as researchers may fear that such transparency could benefit competitors or expose methodological flaws. Altogether, this creates a reality in which scientific prestige can be built on unreliable findings, that led to initiative such as the Center for Open Science.

## Accessibility and Public Funding

Many research studies are publicly funded, yet their findings are published in commercial journals that charge high fees for access. Therefore, even though public funds finance the research, the public itself often can't access the research outcomes directly. Instead, it typically learns about scientific results from media outlets, which may sometimes present the findings in a biased or misleading way to a scientifically uninformed audience, especially if the researchers themselves refrain from engaging with media outlets..

Moreover, researchers work hard to review and publish in journals, while the journals become the gatekeepers for valuable scientific knowledge as they charge for it, from both the public and the scientific community. Scientists themselves are adversely affected by this system: researchers around the world, especially those at institutions with limited funding, often struggle to access academic articles because of high subscription fees. This lack of access hinders them, making it harder to carry out thorough, up-to-date, and high-quality research.

# How does open science help address these issues?

## Accessibility

Open Access is a core component of Open Science. According to [UNESCO](#), Open Access ensures that scientific publications are available freely and without geographic or economic restrictions. This principle ensures that research publicly-funded remains accessible to the very public that funded it, enhancing the role of science in serving the common good. Providing Open Research Data and analysis code reduces financial barriers and allows researchers to build upon existing work and save costs that can then be invested in additional lines of research. Overall, reuse of data and code accordingly minimizes overall expenses on generating new data and analyses. This contributes to cost-effective science, reproducibility, and the possibility of meta-analysis and comparative studies.

**Open Infrastructure** includes platforms, tools, and technologies that support the actual performance of research, its publication and dissemination of research outputs. These may include open data repositories, data analysis tools, as well as open hardware (e.g., blueprints, components, and 3D-printable models), enabling access even in resource-constrained labs. Infrastructure can also include shared access to physical services such as laboratory equipment; specialized tools; or computing power, at symbolic cost or via accessible subscription models.

## Transparency and Sharing in Accordance with the FAIR Principles

**F** *Findable*  **A** *Accessible*  **I** *Interoperable*  **R** *Reusable*

Merely sharing the data does not guarantee its reuse, as researchers should be able to find the data and understand it in order to reuse it. The [FAIR principles](#) (Findable, Accessible, Interoperable, and Reusable) are meant to ensure that this is the case, and are accordingly key to Open Science. They ensure that research outputs – especially data and metadata – are documented, accessible, and reusable by both humans and machines.

When shared according to the FAIR principles, data, code, and methodology can be easily found, the structure of the research can be understood, and the results can be used for validation, replication, or further development. This way, the FAIR principles contribute to the quality, transparency, and collaborative nature of scientific knowledge, as well as ensure research outputs are long-lasting.

## Open Engagement with Society

Open science seeks to broaden the reach of scientific research beyond traditional academic circles. Open engagement of societal actors includes [citizen science](#), crowdsourcing or [crowdfunding](#), and scientific volunteering. These practices allow citizens to participate in data collection, the analysis of findings, formulation of research questions, and even the writing of scientific papers.

Involving non-academic stakeholders introduces diverse perspectives into the scientific process. This enhances public trust in science, increases the social relevance of research, encourages the development of community-tailored solutions, and fosters scientific curiosity among the public.

# Part 02

# Best practices for Sagol School of Neuroscience researchers

💬 **Intro**

The following best practices are intended to guide researchers at the Sagol School of Neuroscience in aligning their work with open science principles. These practices are categorized into several key domains:

# These practices are categorized into several key domains:

### Early-stage planning and research transparency

Ethical, well–documented, and responsible research design

### Open access to data and publications

Ensuring transparency and reproducibility

### Open research resources

Sharing both physical and digital assets generated during research

### Public engagement

Communicating research accessibly and involving the broader public in research

### Intellectual property and commercialization

Informed and appropriate use of IP, using open licensing and sustainable sharing and commercialization models

# Early–stage planning and research transparency

## Ethical use of data

Open science requires researchers to consider ethical implications when collecting and sharing data, especially when dealing with sensitive data or biological samples originating in humans.

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**Researchers should consider the following practices:**

Make sure that **Informed consent forms** include clear explanations detailing how data or biological samples will be stored, shared, and potentially reused for future studies. Consent forms should reflect the intention to share findings as widely as possible, while explaining risks to participants.

**Address long-term data sharing implications during the ethical approval process**, ensuring the research design enables broad dissemination while protecting participants' privacy and rights.

Employ **de-identification, anonymization or pseudonymization techniques**, enabling the reuse of data in further studies while safeguarding participant trust and dignity.

## Preregistration and transparent research planning

Transparency is a cornerstone of open science, as it strengthens research reliability and mitigates statistical biases.

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**Recommendations:**

**Researchers are strongly encouraged to preregister their study plans**: including research hypotheses, methods, and data analysis strategies. **Preregistration is not a binding document**; Rather, it is meant to assist replication, by distinguishing between exploratory research (used for hypothesis creation), versus confirmatory research (testing these hypotheses on a properly powered sample). Preregistration enables clarity even when study plans evolve, since deviations from the original plan are not considered a failure, and are instead reliably documented and disclosed. The school provides a step-by-step preregistration guide for multiple platforms.

Even if preregistration was not performed, when presenting the results, researchers should clearly state which analyses were pre-planned and which emerged during the research process.

# Early–stage planning and research transparency

## Open science–oriented research design

To ensure that research is open, reusable, and impactful, planning for openness must begin at the research design stage.

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**This includes:**

**Data Management Planning**: From the outset, researchers should develop a clear plan outlining how data will be collected, stored, and shared. This plan can be updated as the research progresses. The sharing of physical resources after publication should also be considered in advance (See "Open physical research resources", Page 14).

**A Data Availability Statement** describing how to access the research data should be shared publicly at the time of publication.

**Public Participation in Research Design**: Engagement with representatives from relevant communities (e.g., patients, practitioners, affected groups) in shaping the research questions and methodologies is recommended. Such collaboration enhances both the quality and relevance of the research.

## Reviewing existing open resources

During the initial planning of a research project, existing scientific resources should be reviewed, including open data and databases that might support the efficient formulation of the research question, the development of methodology, and the refinement of hypotheses.

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Thoughtful use of available open resources can reduce redundancy of previous efforts, prevent unnecessary expenditure of time and money, and strengthen the scientific validity and justification of the research.

# Open access to data and publications

## Open access to publications and data

It is recommended to publish scientific articles in a way that allows the broadest possible public access, either by choosing a scientific journal that offers Open Access or by using institutional repositories (Self-Archiving) of the manuscript such as the TAU libraries.

Do note TAU Libraries also reached agreements with leading publishers allowing researchers to publish open-access articles free of charge or with a significant discount.

Researchers are also encouraged to share preprints (early versions of their articles) via open repositories such as arXiv, bioRxiv or PsyArXiv, allowing for rapid dissemination, feedback, and scholarly dialogue before formal publication – without paying open access fees.

Researchers should make sure the article will not be published in a Predatory Journal. The TAU libraries of the faculties of Life Sciences and Medicine provide a Predatory Journal Checkup service that can help.

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## Open sharing of research data

To enable validation, reproducibility, and follow-up studies, all data should be shared in a public, citable repository no later than the publication of the first article using it.

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**When sharing data, consider the following:**

**Level of Detail:** While raw data allows for full reproducibility, it can be expensive or complex to share. In addition, this might possibly threaten participant privacy. In some cases, sharing intermediate, processed data (following common field practices) is more efficient and safer.

**Documentation and format**: Datasets should include detailed metadata and be shared in open, standardized formats whenever possible (e.g., BIDS format for fMRI studies), in accordance with FAIR principles. You can consult the school's guides for sharing various types of data.

# Open access to resources

## Open physical research resources

During the planning stage of a study, it is important to consider the potential for future sharing of the utilized physical resources, such as samples, cell lines, laboratory animals, or unique materials developed as part of the experiment.

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**To support this, it is recommended to:**

**Check whether there are existing biobanks** or similar repositories for the preservation and sharing of materials.

**Include dedicated funds for preservation and sharing** in the overall research budget and seek relevant funding sources for this purpose.

**Consider collecting additional samples in advance** to enable future sharing.

**Address the issue of sample sharing**, aiming to maximize it given the study results **when applying to the ethics committee.**

**Include a clear accessibility statement upon publication**, specifying where materials could be accessed, under what conditions, and for what purposes.

## Open digital tools and research software

Researchers should share all digital tools developed as part of the research so others can replicate, extend, and apply them in new contexts.

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**Relevant recommendations include:**

Upload the **source code** of data analysis pipelines and research software to platforms such as GitHub, preferably using **version control** systems. The school provides [examples and guides for code sharing.](#)

Share **experimental protocols and standard operating procedures (SOPs)** via appropriate platforms or alongside publications.

Publish **technical schematics, build instructions, parts lists, and 3D modeling files** for lab equipment or tools using open-access platforms, or alongside publications.

# Open access to resources

## Sustainable sharing of research resources

When researchers share resources (whether physical samples, equipment, software, or code files) it is important not only to provide access to others, but to allow and encourage their future open use.

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**It is recommended to share resources under conditions that enable:**

**Provenance and recognition of the resource creators**, for example by including a clear request on how credit should be given in future uses, or by defining an open license for the sharing.

**Further sharing of improved or updated versions** of the resource that may be developed later.

**Sharing of further findings or data** generated from the use of the resource, so that others can also benefit from them.

## Use open-source software

It is recommended to use open-source software whenever possible. Such use lowers barriers for other researchers who wish to replicate findings or build upon them for new studies and facilitate data standardization.

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Furthermore, this allows you to contribute and improve the software to best fit your needs and those of the community. When articles make use of open data or open-source software, the original source should be cited using standard citation practices.

# Public engagement

## Making scientific knowledge accessible to diverse audiences

Reading scientific articles, even when they are available through Open Access, is neither common nor easy for most of the public due to a lack of scientific literacy. This includes those with a direct interest in the research content. Moreover, public opinion influences the allocation of the public funding that drives research. Therefore, it is important to invest time and thought in making findings accessible to broader audiences.

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**To that end, it is recommended to:**

**Identify the target audience for the findings:** Who stands to benefit from this knowledge? Who might be interested in the article's results? Is it intended for other researchers in the field, or does it have implications for the public or private sector? Should the research outcomes be shared with the general public, presented to policymakers, or made accessible to patients or physicians? What kinds of partnerships could the research foster, and who is impacted by its findings?

**Explore appropriate outreach methods:** Collaborate with communications teams, such as the university's public relations and media departments, or with science journalists. It is recommended to develop supplementary materials, such as plain-language summaries, simple graphs, public lectures, or social media posts.

# Intellectual Property

## intellectual property and commercialization

It is recommended to adopt intellectual property models that do not restrict the free use of research outputs for the greater good of society. The use of trademarks, certification marks, or defensive patents (even through Ramot TTO) may limit the freedom to operate even for humanitarian, academic, or educational purposes that do not generate profit. Open licenses suited to the nature of the research outputs should be applied and clearly indicated.

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### Recommended licenses include:

Free content licenses (such as **Creative Commons**) for articles, texts, and visual materials

Open–source licenses approved by the Open Source Initiative for software or code

Open data licenses (such as the Open Database License) for datasets

## Open Science–Compatible Commercialization

When planning the commercialization of research outputs, it is recommended to prioritize approaches that do not rely on restrictive intellectual property protections in the early stages, such as patent registration. In fact, such protections may limit both the impact and the financial benefits of the research outcomes.

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### Instead, it is advisable to promote open and collaborative models that enable free access already during the development phase, such as:

**Commercializing** software under an open-source license.

Developing **open hardware**.

**Collaborative models** for drug discovery, for example, in partnership with relevant foundations.

**Establishing Partnerships** with public or private entities.

Specifically allowing the creation and sharing of **educational resources**, such as open textbooks.

# Intellectual Property

## Transparency and Justification in the Use of Proprietary Restrictions

When researchers believe there is a need for proprietary or contractual limitations, such as to protect participant privacy or enable commercialization, it is important to plan for this in advance, understand the implications, and act as transparently as possible.

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**To support this, it is recommended to:**

**Carefully consider the reason for the restrictions**: Why are they necessary in this specific case?

**Clarify the scope of the restrictions:** To what extent do they limit the reuse of research outputs? Do they apply to humanitarian, educational, or academic uses, and/or to uses with appropriate credit?

## Sustainability and Long-Term Access

Imposing proprietary or contractual restrictions on research outputs aimed at ensuring provenance, long-term value and ongoing accessibility (e.g., to cover production or maintenance costs) does not contradict the principles of open science.

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Some restrictions are recommended when they help preserve open access to scientific resources in a sustainable manner (see page 15: Sustainable sharing of research resources).

# Appendix A
# SSN Open Science Principles

### Intro

Open Science (OS) encompasses a broad range of practices intended to remove barriers in science and allow the dissemination and use of research outputs. Embracing Open Science not only enhances the quality and impact of research but also fosters a culture of transparency and collaboration. By participating in Open Science, researchers contribute to a global movement that accelerates scientific discovery and benefits society as a whole.

# Open Science (OS) encompasses a broad range of practices intended to remove barriers in science and allow the dissemination and use of research outputs.

**The Sagol School of Neuroscience (SSN) believes that following Open Science principles greatly contributes to better planning and execution of experiments; invigorates collaboration and innovation within and across disciplines; and is fundamental to the ethical usage of public funds in research.**

Embracing Open Science not only enhances the quality and impact of research but also fosters a culture of transparency and collaboration. By participating in Open Science, researchers contribute to a global movement that accelerates scientific discovery and benefits society as a whole.

To ensure our scientific effort is excellent, reproducible, and FAIR (findable, accessible, interoperable, and reusable), the SSN is institutionally oriented towards Open Science and is committed to providing the required support for individual researchers in adopting current open science practices and future best practices. SSN will offer ongoing guidance and help align institutional practices with all relevant principles and commitments.

SSN will ensure that researchers adhere to responsible research practices, including responsible data management, compliance with intellectual property laws, and respect for participants' rights and dignity. Open Science must not compromise legal or ethical obligations or any applicable data protection principles.

# SSN Open Science Principles

## 01  Release of research processes and outputs

**Subject to the applicable laws, and in particular privacy and data protection regulation, SSN strongly encourages researchers to publish open access articles and share their scientific resources – research methods and materials, software, analysis tools, physical resources, as well as raw data and metadata – as early as possible, and no later than the date of publication of the first article that relies on this data or resource.**

Open practices should be considered in advance, during the planning and design stages of a study. Best practices include data management and sharing plans in reusable, machine-readable formats and in accordance with the FAIR principles, considering using and contributing to open-source software tools and using existing open data sources.

Researchers are highly encouraged to make scientific findings available early and openly through preprints of their work and use self-archiving or open access publishing to make their articles open access.

Scientific resources generated through any partnership by SSN researchers should aim to adhere to SSN Open Science Principles.

## 02  Inclusivity, collaboration and dissemination in science

**SSN supports sharing of research outputs beyond SSN researchers, to foster a culture of inclusivity and shared knowledge with external collaborators and the public.**

SSN supports non-exclusive, irrevocably available, worldwide access and freedom-to-operate research outputs for further research, education, and humanitarian efforts. SSN believes research should be communicated in a way that allows the wider public to understand, own, and contribute to scientific progress.

## 03  Open Science Compatible Intellectual Property

**SSN's position is that restrictions on reuse should be minimized whenever possible to allow for fast, impactful, and beneficial work.**

Researchers should positively consider alternatives to restrictive IP that maximize the unlimited freedom-to-operate of any entity, public or private, to use outputs or other results of research conducted by the SSN community and collaborators. SSN will support any efforts to minimize restrictions on the reuse and sharing of intellectual property.

## 04  Researchers and Participants Autonomy

**Researchers retain full autonomy and academic freedom in how they approach Open Science.**

SSN recognizes and respects the autonomy of its stakeholders – including researchers, staff, trainees, and research participants – and upholds their right to opt out of participation in activities conducted under SSN's Open Science Principles or to refrain from applying SSN's Open Science principles for any purpose. However, SSN will ensure that funds designated for Open Science are used exclusively to support initiatives that align with these principles.

# Appendix B
# References

**The Topics:**

Open Science Concepts & Standards

Research Culture & Replicability

Preprints & Early Sharing

TAU Services – Open Access & Predatory journals

Data, Software & IP Licensing

Public Engagement & Citizen Science

# References

## BIDS: Brain Imaging Data Structure

UNESCO: About Open Science

UNESCO: Open Access

The FAIR Principles (GO FAIR)

Center for Open Science (COS)

BIDS: Brain Imaging Data Structure

## Research Culture & Replicability

Why Most Published Research Findings Are False

The "File Drawer Problem" and Tolerance for Null Results

Reproducibility Project: Psychology (OSF)

Predatory Journals: What They Are and How to Avoid Them

Publication bias and the canonization of false facts

The Hidden Cost of Subscriptions

TAU CRIS : Replication publications listing

COS: Registered Reports (RPCB)

COS : Preregistration resources

## Preprints & Early Sharing

arXiv (multidisciplinary preprint server)

bioRxiv (life sciences preprint server)

PsyArXiv (OSF Preprints, psychology)

## TAU Services – Open Access & Predatory journals

TAU Libraries: Publishing in Open Access

TAU Libraries: Predatory journals info

TAU Libraries: Predatory journal identification service

Sagol School's Data Sharing guides

## Data, Software & IP Licensing

Open Data Commons: ODbL License

Open Source Initiative: Licenses index

Creative Commons: About CC licenses

Ramot (TAU Technology Transfer)

Do universities investing in technology transfer via patenting lose money?

## Public Engagement & Citizen Science

UNESCO: Public engagement & crowdfunding in health research

National Geographic: What is citizen science?

# Open Science at Sagol School

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