CSEP 2021 Data science for the modern Exercise Physiologist

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Open science for the modern Exercise Physiologist

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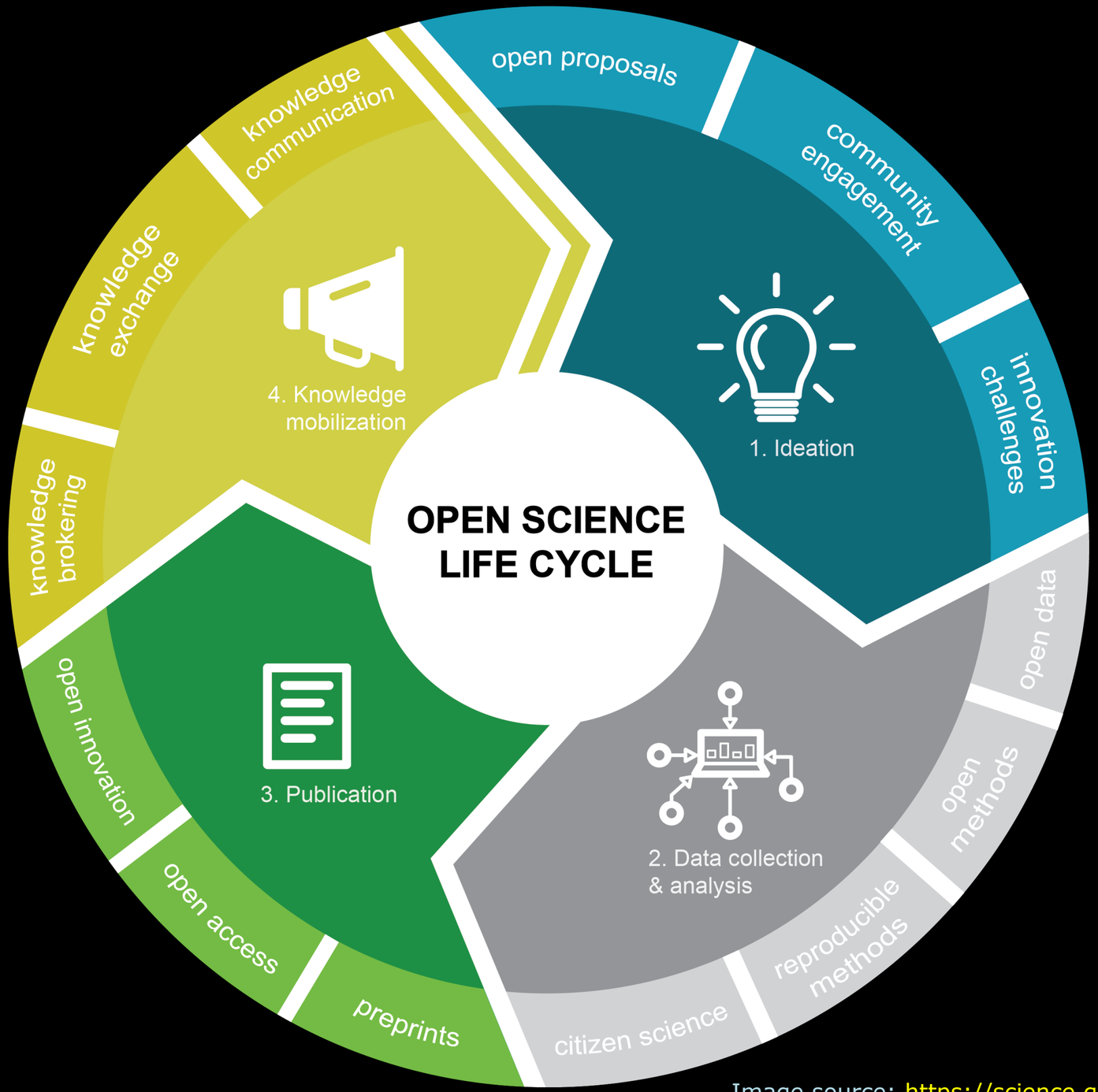


Image source: https://science.gc.ca/eic/site/063.nsf/eng/h_98054.html

Why? Principal Investigators & Senior Collaborators

- Comply with Canada's research funding agencies (e.g., CIHR and NSERC).

  Open Access Policy on Publications (https://science.gc.ca/eic/site/063.nsf/eng/h_F6765465.html)

  …"the Agencies have a fundamental interest in promoting the availability of findings that result from the research they fund, including research publications and data, to the widest possible audience, and at the earliest possible opportunity".

  Research Data Management (https://science.gc.ca/eic/site/063.nsf/eng/h_547652FB.html)

  "Research data collected with the use of public funds belong, to the fullest extent possible, in the public domain and available for reuse by others."

- Support the future success of your trainees in academic or non-academic careers.
- Increase the impact or credibility of your research program.
- **Avoid disaster** [1].

Why? Masters, PhDs, Post-docs & other ECRs

- The incentive structure is changing.
- Many universities have signed DORA (https://sfdora.org/read/).
- Consideration of research integrity will appear on post-doc and job advertisements.

  "Our department embraces the values of open science and strives for replicable and reproducible research. We therefore support transparent research with open data, open material, and pre-registrations. Candidates are asked to describe in what way they have already pursued and/or plan to pursue open science".

- Data science skills are becoming essential in exercise physiology. Start now: future you will thank present you!
- Preprints are accepted on most Canadian MSc/PhD/PDF/project funding applications (papers that are only under review are not because there is no evidence that the work exists and the quality cannot be assessed).

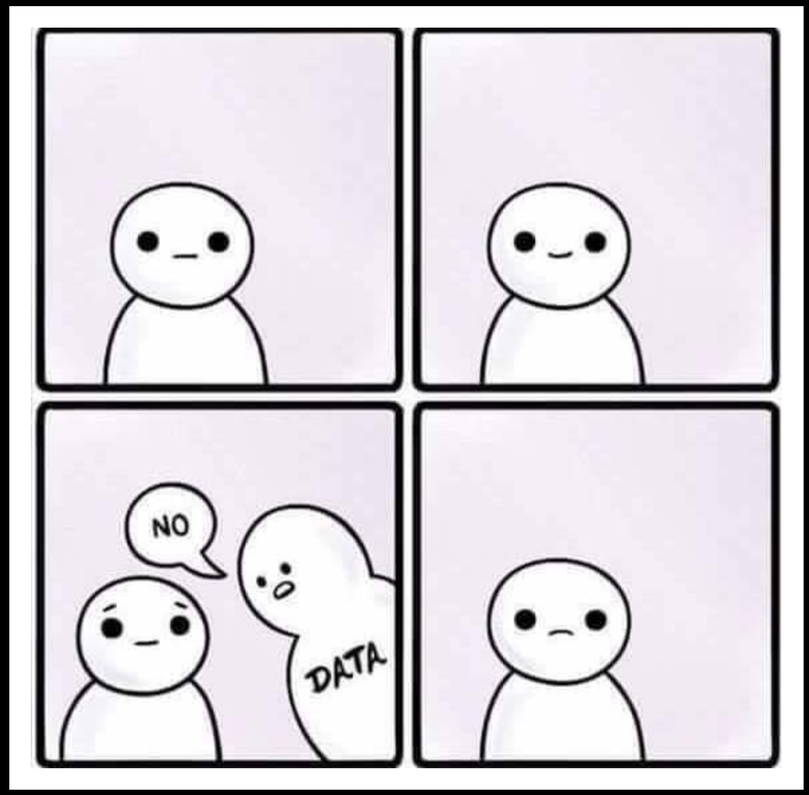
Why? Everyone involved in exercise physiology

To improve the credibility of the scientific literature in exercise physiology.

Considering:

- Difficulty in replicating findings and evidence questionable research practices and publication bias in other disciplines with human behavioral experiments.

- Poor reporting practices in recent society-led kinesiology journal articles (MSSE, EJSS, JSAMS) [2].



Top tips for exercise physiologists

- Don’t be put off by **all-or-nothing approaches** to open science (there are many barriers for ECRs [3])
- Do your best **given current circumstances** (lab culture/supervisory team).
- Find **community** within or outside your lab/institution.
- Incremental progress is **still progress.**

Tangible Incremental progress

Now

- Sign up for an Open Science Framework account (https://osf.io/register?campaign=&next=&view_only=)
- Watch a seminar on the STORK YouTube channel (https://www.youtube.com/watch?v=Lw2X4cXmtkQ&t=1s)
- Have a look around the STORK, RISE, and SportRχiv websites (https://storkinesiology.org/)

Paper under preparation

- Conduct data analyses using open-source software (R, Jamovi)
- Report methods and results transparently using reporting checklists, supplementary material etc. (https://www.equator-network.org/)
- Share some study materials to make you methods replicable (protocols, intervention materials, participant instructions, questionnaires)
- Share a de-identified dataset and analytical code
- Share your work on a scholarly archiving repository to make it openly accessible without having to pay any fees (https://sportrxiv.org/index.php/server/about)

Next study

- Include de-identified data in your ethics application and the informed consent process
- Distinguish between confirmatory (hypothesis testing) and exploratory (hypothesis generating) research
- Pre-register your confirmatory hypotheses or consider using the registered report format (https://storkjournals.org/index.php/rrik/information/authors)
- Evaluate work based on methodological rigor and transparency rather than novelty

Forward thinking

- State your requirements for transparency upfront when beginning a new project
- Support a meta-research project in exercise physiology
- Contribute to an open educational resource (https://kinesiologybooks.org/index.php/stork/catalog/book/10)
- Use open science as a teaching and mentorship tool in exercise physiology
- Use open science practices as your/your lab's norm and default
- Sign your peer reviews (at your discretion if you're an ECR)

References

[1] Markowetz, F. Five selfish reasons to work reproducibly. *Genome Biol* 16, 274 (2015). doi: 10.1186/s13059-015-0850-7

[2] Twomey R, Yingling VR, Warne JP, Schneider C, McCrum C, Atkins WC, Murphy J, Romero Medina C, Harrley S, Caldwell AR. The nature of our literature: a registered report on the positive result rate and reporting practices in kinesiology. *Reports in Sport and Exercise*. (A registered report under stage 2 peer-review).

[3] Allen C & Mehler DMA. Open science challenges, benefits and tips in early career and beyond. *PLoS Biology*; 2019 17(12): e3000587. doi: 10.1371/journal.pbio.3000246

[4] Caldwell AR, Vigotsky AD, Tenan MS, et al. Moving sport and exercise science forward: a call for the adoption of more transparent research practices. *Sports Med*. 2020;50: 449–459. doi: 10.1007/s40279-019-01227-1

Other links:

- A directory of open access repositories: https://v2.sherpa.ac.uk/opendoar/
- A searchable database of publisher policies on copyright and archiving: https://v2.sherpa.ac.uk/romeo/
- An Open Science Training Handbook: https://github.com/Open-Science-Training-Handbook).
- FAIR data principles: https://www.go-fair.org/fair-principles/
- An entry-level book on shoddy science: https://www.sciencefictions.org/

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