INTERVIEW:
OPEN THE GATES TO OPEN SCIENCE

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Insight

Research and science are constantly changing, always evolving. One of the changes that we are going through right now is the transition towards open science. For this article three members of the Open Science Community Nijmegen, an academic organisation with the purpose of making science more transparent, rigorous, and reproducible, were interviewed [1]. I was joined by Jeanette Mostert, an associate principal lecturer at the Radboudumc, Eva Poort, a postdoctoral researcher at the Max Planck Institute for Psycholinguistics, and Jeroen Bos, an open access officer at the Radboud library. In our interview, we discussed the role of open science in (bio)medical science, and how we, as aspiring young scientists, can contribute to more open science, and the importance of preregistrations.

The what and why of open science

Let us first look at what open science actually is. Mostert says, "I think open science is very broad" "it includes many different aspects. It includes open access, it includes open data, reproducible data. So, I think the whole idea of open science is that we're making science transparent, in the way that it is conducted, in the way that it is collected, and the way that it is reported. But of course, there are also aspects like citizen science and inclusivity. So, you make science inclusive and accessible." To the question why we need open science, she answers, "Why not? I mean, it is not really a question of should we, or should we not have open science? It is more of a question of how than why." Bos agrees with this statement: "I like that view. Why not open science."

Still, the monitor of openaccess.nl reports that only 62% of articles in the Netherlands are published open access, and not all studies are preregistered [2]. What are the hurdles that need to be taken into account? "It is money, it is skills. It is the availability of resources. So, time, definitely. Experience. Tradition," says Mostert. How can we make the change to more open science?

Jeanette Mostert

Opportunities for young researchers

As (bio)medical students, we are at the start of our careers. Maybe you can remember the lectures you had about aspects of open science, but how can you bring them into practice once you start doing research? Mostert says, "I think as a young generation, you always have the responsibility to change traditions, right? Because the people who have been in the field for longer, they are so used to the way things are done. And for them, it is harder to change something. If you're new, you have to learn things anyway. So then you might just as well learn a new way of doing it instead of the old way." She gives a few practical examples: "If you are learning about the publishing system, then you might just as well learn about publishing open access. If you are learning how to write code for your analysis, you might just as well learn how to make it a reproducible code, and how to share your code. And if you are thinking about how to collect your data, you can also think about how do I collect it in a way that I can also share my data?". Poort adds, "I think it is easier for the younger generation to question the traditions because they were not there when they arose. And a lot of traditions, I think, in science are a product of how things used to be much more difficult. A lot of aspects of open science used to be a lot more difficult."

Eva Poort

Transparent statistics

One of the examples Poort gives is about making the code for your analysis more transparent by using R. By sharing your code, you make it more transparent how you did your statistical analysis, and other researchers can reproduce your study [3]. Poort says, "In terms of statistical programming, there used to be basically just SPSS, which is not very reproducible, but now it is very easy to learn about R. So, it is also much easier for the younger generation to ask, well, why are we still using SPSS? Because there is now this very easy alternative that is free and anyone can learn to use it." We first learn how to do statistics during our study. R is free, open source, useful for many types of data, and reproducible [4]. However, it can be challenging for educators to make the switch from SPSS to R. Poort knows this from her own experience when she was involved in teaching at University College London. "The statistics lecturer only knew how to use SPSS and most of the students' project supervisors also only knew how to use SPSS. So, for years they said, 'no, we cannot possibly teach the students how to do this in R because then the people who need to give them grades do not understand their statistical analyses.'". But eventually, they did change to R and now they get positive feedback from students about it.

Mostert adds another important point why young scientists should learn about open science practices: "Because if you are an established researcher it's not a big issue if you're still using SPSS. But if you are a student now, then you still have your whole career in front of you. You need to learn skills that are relevant also in the next ten years."

Preregistration

One of the practices of open science that you can already start with during your internships, is preregistration. By preregistering your study, you define your research questions, hypotheses, and plan of analysis before the start of your research [5]. In this way, you clarify what you planned to do, and show that you did not try many different analyses just to find a significant result. Moreover, Naald et al. (2020) found that the data of only 26% of animals found in study protocols, end up in a publication. They plea for preregistration to prevent reporting and publication bias [6].

I asked whether preregistration would also be a good idea for internship projects. Mostert says, "It is a great exercise, actually for the internship, because you're really forced to think about your plan in a structured way." Poort adds, "The thing that I like best about preregistration is that it really forces you to think about how you are going to do the experiment, but also how you are going to do the analysis because I have noticed in myself and in a lot of others as well. You have this idea of how you are going to do an experiment, then you do your experiment, and then you go on to the analysis, and you realize that actually, your data is not in the right format or you asked the wrong questions in your questionnaire. Then suddenly, at the end, you realise you cannot analyse your data so that you have an answer to your research question."

Preregistering your internship projects has a lot of advantages, even if you are not going to publish. "An internship is a learning experience. You can think about your study design, but then things can go wrong, right? For a million different reasons. Either your lab closes, your mice die, your cells perish," says Mostert. Later she adds, "But then you can show that you thought about your study design really well, even if nothing came out of the study. That is already something I think, maybe even more important for applying to PhD positions than having this published result."

Jeroen Bos

Practical tips for preregistration

Several websites offer opportunities for preregistering your study. Two of them are for example the Open Science Framework Registries and AsPredicted [7, 8]. Poort also gives some practical tips for preregistering your study: "The first preregistration you do is never going to be perfect. When you write the second one, you will realise, I was really not clear in the first one about what I meant to do exactly. But, as with everything in science and life in general, you always have to start somewhere and learn." She further explains that making mistakes in your preregistration is no problem at all. "An important part of preregistration is also the transparency. So even if you were not clear about something, or if you preregistered something and then you later find out that it is not actually possible to do it that way, that is not a problem. You just say in the paper: 'We made a mistake', or 'We did not realise that this was going to happen', or 'We realised we were not entirely clear in the preregistration', and you just explain what you did intend." In other words, as they formulate at Open Science Framework: "a preregistration is a plan, not a prison" [9].

Another tip by Poort is, "To try and read a lot of preregistrations of projects that are similar to yours, or at least projects that use statistical analyses and collect data similar to yours. Because then you get an idea of what they write about, and how they are going to do their data cleaning, how they are going to do their analysis, how they determine their sample size. That is how I learned to write my preregistrations. It is also a good idea to get into the habit of essentially writing them as a method section. So, then you have exactly the information that you would normally report in a paper (maybe you include a little bit more information than you would report in a paper), but that way, at least it is very clear what you are going to do, and how you plan to do it."

Her last tip is to use a template or a framework. "My first preregistration was actually using the Open Science Framework's Preregistration Challenge template. It has a long list of questions that they want you to answer, so that already gives you something to hold on to in terms of what information you need to include in your preregistration." In addition, the websites of both OSFRegistries and AsPredicted have several templates available, depending on the kind of research you are writing a preregistration for [7, 8].

Publishing Open Access

Another pillar of open science is publishing your research with open access. Open access ensures that other researchers and the general public can access your article without any barriers [10]. However, usually, there is a fee for authors if they want to publish open access. If you have the opportunity to publish as a student, Bos has a valuable tip for you: "And if you are going to publish, actually, I like to add, if you are going to successfully publish your results, there are many, many outlets for students also where you can publish in open access for free, or with heavy discount. Check the Library website for more information about open access publishing (for students)."

Conclusion

In conclusion, we discussed that open science is a very broad topic. The changes that are happening are happening slowly, and we, as future young scientists, have a part to play in the revolution towards open science. One important aspect of open science is preregistrations, as this allows us to plan our research question, hypotheses, and analysis plan before starting a project, to make research more transparent. Practical tips for preregistering your study are using a template, reading a lot of preregistrations, and learning from your mistakes every time. What will you do to make your next internship or research project more open?

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EXAM QUESTION

Question 1

In a certain inhibitory synapse, under the influence of glycine, the chloride channels are opened in the postsynaptic membrane. This causes chloride ions to flow into the cell. What effect does this have on the membrane potential?

A. Depolarisation
B. Hyperpolarisation
C. Repolarisation

(Topic from Q1 MGZ Neurology, 2020)

Question 2

A 58-year-old woman is diagnosed with a stage T3N2M0 colon carcinoma. This means that…

A. the tumour has grown into the serosa and is only present locally.
B. the tumour cells have spread to the lymph nodes as well as to other distant organs.
C. tumour cells have also been found in the lymph nodes, but no distant metastases have yet been detected.

(Topic from Q5 MGZ Immune system, 2020)

The answer to this question can be found on page 29 in this journal.