Hello, welcome everyone to this last video on being transparent. In this video, we'll try and tie some of the concepts we discussed before together. And we will also try and give you a realistic bit of insight on what it might be like to attempt or try and adopt some of these approaches. And we'll just go over what it's like to be working more transparently. So we talked about some things which you would maybe apply in an ideal scenario where you would work very openly and transparently. So you would come up with a very detailed research plan before conducting it, as Niamh told you about. And ideally you'd either pre-register this or submit it for peer review in a registered report format. Or, what you would also do is ideally open up your, your methods and your notes. Maybe your electronic lab notebook might be shared with other people. Then also, ideally you would make your work openly accessible so that people don't have to pay to read your work. And also in the ideal scenario, you would make your data and other materials you use for your, your research openly accessible for other researchers. So they could, for instance, try and reproduce it, see if the pipeline works. But also maybe built on the research may be in a meta-analysis. They could take it to find other things, may be in the data other things that you haven't researched yet. So that's the ideal scenario. That would be fantastic if everyone could do this. But of course the real world, yeah, has some hurdles. And putting things into applications is always trickier than just talking about them in abstract terms. So, for instance, making your research openly accessible sounds very simple because it's the same kind of publication process you go through. But sometimes journals can charge a lot of money for the article processing costs. And they typically charge more for open access publications because they don't get any money from, from people accessing and reading the material. So they only get one lump sum that the researchers themselves pay to get it published. And sometimes these take pretty absurd proportions, these amounts that are asked for uploading a PDF or maybe, maybe printing it in an actual magazine. But the amounts can be quite shocking sometimes. And not every researcher and every research group or every university has the funds to cover those fees. In those cases, sometimes it can be an option to upload the manuscript somewhere, for instance on bioRxiv or another archiving repository. And that could be a way to still open up your research if the publisher allows you to that. So there are some hurdles here And the same with opening up your, your data for instance, because there are several privacy laws that are intended to, of course, guard our privacy and guard our sensitive information. But they sometimes clash with the transparency values in research. For instance, the GDPR, which is which was originally made for the EU. The UK of course left the EU and I believe they still have their own copy that's very similar to the European GDPR. But it's under review and it can change a little bit. But the, in principle, there are many, many similarities still between the UK version of GDPR in the EU version. And there can be several tricky things related to where you can publish your data maybe or what parts of the data you can publish. And it can be quite complicated, even legally. So before you just dump your data somewhere on a repository, you have to really make sure that you have looked at the, what you are allowed to do, what you can and cannot share. And for instance, a useful tool for that is to ask the Research Data Service at University of Edinburgh. They also do some courses sometimes on sensitive data and how to deal with that. And they can point you in the right direction for some resources on how to educate yourself, but it can be a tricky field to navigate. So don't underestimate that! And unfortunately that sometimes hinder us from publishing our data, but sometimes there are still ways of publishing parts of the data or doing it in a very Protected way, maybe where someone can only access the data in a certain location. Like a physical location. Or there are very comprehensive data transfer agreements written. So there can still be ways to work around it it just takes more effort than just publishing it somewhere, sometimes Right, so given that in the real-world, sometimes we cannot apply all of these things as we would maybe like to. We thought it would be useful for this video to focus more on the underlying attitude [and] of what it is like to work transparently and what you have to commit yourself to. So if we're talking about working openly and transparently,

we're talking about honestly recording and presenting all your steps, outcomes in your research. And sometimes that can have some awkward moments also like there can be some, some friction between maybe what you have done in the past or what you've learned in the past of how you should do research, what you've seen people do around you what maybe people ask you to do. And so just to point out some of these maybe these issues that can arise or these like, yeah , uncomfortable, maybe friction situations. We'll just go over some do's and don'ts. Very concrete. Of course, again, be realistic about what works in your situation. But this is to just clarify some very explicit examples of where you would maybe take a more transparent approach, whereas you could also take a more non-transparent approach. So just to highlight some of these, we'll go over those. So first one, once you have established a very nice research plan, as you did according to the recipe. Ehm, really try and rely on that as your framework and your guide. And don't keep trying to change things or move things around. And definitely don't keep trying things just in general until you get a significant result. But make sure you put in the time to work on that plan. And then also trust it and rely on it. And related to the plan, is also to try to make any changes to it before you get to the official analysis phase. Phase. If you wait until the very last minute, you might have already seen the results and that might have influenced your decisions. So if you can try and make any changes to your analysis phase and plans before you conduct them. If we're talking about the confirmatory research, of course, which we'll get to later in this list as well. And then also what we discussed in the previous video. If you take good care of transparently recording all the changes in your notebook. Also trying to report these as much as you can and open up about these and try not to hide any changes you're making because you were embarrassed about making mistakes at the start. This is quite an interesting one. We had an Edinburgh ReproducibiliTea session on mistakes in research in January 2022. Mistakes can of course take a wide range of magnitude, maybe you could say. There are of course the honest mistakes. Maybe things you didn't know, you didn't really learn yet. Maybe skills you haven't fully developed yet. Those are more honest mistakes. Then you've got a grey area of more kind of "p-hacky" strange things about excluding outliers or not excluding outliers in a certain way, those kind of "mistakes". And then at the very end, you've got outright fraud. Of course, making up data, completely deleting any data that doesn't fit your hypotheses. So there's a wide range in these, but here we're talking more about the kind of honest mistakes. If you feel like you have to hide those - that kind of hinders you from feeling like you can open up your research in your research process. Um, if we would all just admit that we all make mistakes and we're all humans. You have to learn. You just, you don't just wake up out of the blue and you're the perfect researcher. We all have to learn mistakes and ideally learn from our mistakes. And ideally we would help each other learn from our mistakes. And the research culture should have a self-correcting principle also to it that we try and help each other so that the literature stays as mistake-free as possible, of course. But we only know if people make mistakes, if they are open about what they're doing. So as long as we feel the need to have like a completely perfect record, then that actually hinders us being more transparent and open about everything we do in the research. So that's another thing to consider. Clearly indicate which of your hypotheses and analyses are confirmatory and which ones are exploratory. And don't go back to your original research question and main hypotheses after seeing the results and changing those. So yes, we've got, on the one hand, the confirmatory research that of course tries to test, test the ideas that were already maybe coming up from more exploratory research that happened before and that showed some interesting results. And then you want to go and do a confirmatory one. We have a very clear hypothesis, testable - if the result show this (X), then this is the conclusion And if the results show this (Y), then this is the conclusion On the other hand, the more exploratory research where you try and find interesting patterns in the data, for instance. And then the next step would be to see if that holds up in a confirmatory test in a separate study. Of course. Both kinds of research are very important for

the progress in research. But you have to be very clear about which is which if you start blurring between the two of them, most often the exploratory research is presented as if it were confirmatory. A result comes up and people draw a circle around it and they make a nice narrative around the results. And that is not very helpful because then we don't know that we still have to test that in a confirmatory new research And people start taking things for granted and things don't get replicated. And yeah, there's just so much that can go wrong and it can be very misleading if we're very vague about what kind of research we're doing. So try and avoid that. Try and be very explicit about what these analysis are that you want to do. What kind these are, what hypothesis you have for these. And that can be tricky, that can be hard to really put that in a category, but try and do so as best as you can Yes. This is a very specific one. Apply multiple comparison correction is if or when applicable. And also acknowledge the limitations of your research. And don't ignore or talk over the family-wise error rate and other limitations. So if you do a lot of analyses, of course you have to. You have to correct for doing multiple analyses because the more analyses you do, the bigger your chance is that you're going to find a significant result by chance. So that's very much related to these previous points of confirmatory exploratory research and analysis changes. So it's important specifically that one as a thing to consider when you're writing up and telling people how to evaluate your research really. If you were very honest about the limitations of your research, you give people an honest framework to evaluate your research with. And maybe that helps them to understand like how or what maybe are the weaknesses in your research? What can they do in the later research study, later analysis to maybe fill in some of the gaps that are still in your research. That's how we should help each other, right? And we need to be, but we need to be aware of the limitations of research in order to evaluate it and know whether you should build your own research on this or not, or maybe there's more research needed first to confirm certain things. So yes. Again, in this section be as open as you can, as honest as you can. And don't just ignore it and talk over it. Right so, there are some final comments This is a no-brainer of course. But I just wanted to emphasise this again that, although this sometimes isn't apparent in what gets rewarded with publications, but significant results are not better or more important than non-significant results. We need to know all the results before we know where the truth lies, we need to know which paths to pursue and which paths no longer to pursue, because all the people already found out that it doesn't work. It would make research so much more efficient if we would all publish this or all the research would get published and you see in registered report publications that the balance between significant and non-significant results is greatly shifted as compared to what's normally published. Of course, many, many more non-significant results get published because that makes sense that not everything can be true, not everything can be significant and not every test can be significant if they're reflecting the reality. So hopefully you at least are aware of this also in your general like, transparent attitude and you have this built-in, that non-significant results are just as valuable as significant results. And then last one, as you go and progress through your research, please think about the three T's. Think before you do, Trace your steps and be Transparent. And with that I want to wrap things up. So thank you very much for sticking with us through this course on open research. If you find this interesting, and you want to know more about open research. I would suggest you have a look at the Edinburgh ReproducibiliTea group. Maybe attend one of their sessions. And the Edinburgh Open Research Initiative, as I showed in the first video, has a lot of useful resources for you to get started. There's also a Teams channel to which will put the link to join below, which is an Edinburgh-based Teams channel where people discuss open research stuff, share opportunities, resources, those kinds of things. So that might be nice place for you to get started as well. And if you have any questions, please reach out to us. Our emails are on this page and thank you and best of luck in your further research and hopefully with applying some open research practises.