**Peer Review and Communication History**

**MS Title**: Promoting Open Science: A Holistic Approach to Changing Behaviour

**Author Names**: Robson S. G. (0000-0002-2777-9347)

Baum, M. A. (0000-0002-1006-3430)

Beaudry, J. L. (0000-0003-1596-6708)

Beitner, J. (0000-0002-2539-7011)

Brohmer, H. (0000-0001-7763-4229)

Chin, J. M.(0000-0002-6573-2670)

Jasko, K.(0000-0002-3195-8268)

Kouros, C. D. (0000-0001-7586-8611)

Laukkonen, R. E. (0000-0001-8848-9231)

Moreau, D. (0000-0002-1957-1941)

Searston R. A. (0000-0001-7295-8021)

Slagter, H. A. (0000-0002-4180-1483)

Steffens N. K. (0000-0002-3990-2592)

Tangen J. M. (0000-0002-0649-2566)

Thomas, A. (0000-0002-1205-0342)

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**Editor First Decision**: Revise & Resubmit

May 31, 2021

Dear Samuel and the author team,

Thank you for your submission of “Nudging Open Science” for consideration at Collabra. I read your paper independently before considering the input of two reviewers, both of whom are experts on open science along with behavioral economics. The reviewers and I agreed on many points. We all very much see the promise in your paper, but agree that there are important – and substantial – revisions required. I am going to highlight what I see as the three most crucial points to address, but be aware that these are fairly sizable issues to tackle. In addition to these three main points, I would also like you to respond to each of the reviewers’ points. You do not have to make every change that the reviewers suggest, but I would like you to address each point, explaining why you have or have not opted to make a change.

Three main points:

1. Both the reviewers and I noted that your use of the term nudging is not well supported and likely needs to be revised. Indeed, as Reviewer 1 notes, nudging is a technical term with associated boundary conditions and theory. Here, you seem to use the term much more loosely. The current usage of the term will be confusing to readers who come to your paper expecting an analysis of open science interventions using nudging principles. For instance, you write “Wrangling data, using sensible variable names, and producing attractive visualisations are other small nudges that go a long way toward making data analyses more interpretable” (p. 19) or “Researchers can nudge departmental chairs (or equivalent) to include explicit statements about open practices in the advertisements they post” (p. 22). As another example – on p. 28, you discuss “the power of defaults.” But these journal policy changes are requirements/mandates, not nudges. None of these applications are nudges in the sense of being changes to choice architecture that encourage desired behaviors. These are just examples, as there are many more instances throughout the paper.

I can see two ways forward here. One option would be to do as Reviewer 1 suggests and eliminate the word nudge from the paper (and its title) to more clearly indicate what the paper actually is about (i.e., suggestions to stakeholders to improve uptake of different open science practices). The other option would be to overhaul the paper to focus more narrowly on proposed nudges. I would want to see a clear, detailed definition (supported with references) of the nudging concept, along with succinct, focused applications of the concept in the open science domain. This would involve cutting a lot (more than half) of the current text and then resituating the paper more directly within the nudging framework. I believe the first option to be more achievable, but the second would be valuable if done extremely well.

1. The second major issue relates to the structure of the paper. Both reviewers noted, and I agree, that the paper is not well organized. All of us liked the use of different stakeholder groups as an organizing framework for the paper. Yet, we also agreed that revisions would make the paper much more coherent.

There are some inconsistencies within the different stakeholder sections. For instance, the researchers section is several pages long, with large topics (e.g., preregistration) nested within it. Other sections (students, libraries) are much briefer. As noted by Reviewer 2, it’s not clear why a topic like “evaluation” belongs within researchers as opposed to one of the other stakeholder groups (institutions, libraries). Reviewer 1 notes (and I agree) that some topics repeat unnecessarily; for example, I noted at least three mentions of the N-best paper method of evaluation. Finally, the paper also ends rather abruptly with very little in the way of a unifying conclusion.

In addition to stakeholders, the two frameworks (pyramid of culture change and EAST) seem like promising anchors to guide the structure of the paper. Yet, they are introduced at the beginning and then barely discussed again. At the outset, I imagined that each proposed nudge would be directly linked to part of one of the frameworks. Reviewer 2 makes a similar point (their Major Point 2).

I hesitate to give strong guidance or direction as to how the paper should be restructured, especially given the two very different directions offered in my first point. Regardless of how you choose to revise, I recommend that you reverse outline the paper to get the big picture of how the different sections fit together and how they tie to your central argument. Reviewer 2’s Specific Point 3 gives another idea for reorganization (they describe a table, but you can extend their suggestion to think about the set up for the paper itself).

1. As noted by Reviewer 1, the current draft is not very clear on which topics are areas where you speculate (or give an informed opinion) as opposed to topics for which there is some evidence for a particular practice (either in the nudging literature or in an evaluation of an existing open science practice). Please be clearer in the revision about what the status of the current evidence base is for each proposed nudge/practice. This part is just a suggestion (take or leave), but I could imagine organizing suggested practices as follows: practices that are already in use that likely are effective because of nudging principles (e.g., open science badges) vs. practices that are not yet in use, but might be effective because of nudging principles (e.g., adding fields to journal submission forms to encourage deposit of data or code at submission) vs. practices that are currently in use that are ineffective because they violate nudging principles and therefore need to be revised (e.g., citation counts on CVs).

Additional points of note:

1. The paper as it stands is lengthy, and it includes detailed discussions of topics that are well covered elsewhere. You should feel free to cut with an eye towards reducing lengthy introductions of topics that have been covered in many other reviews.
2. Figure 1 is a bit hard to read. The arrows are not easy to follow, and it relies on color to carry the message. Is there another way to arrange this important figure more clearly?
3. Depending on how you decide to restructure the paper, I would consider revising or cutting Table 1. This is a nice list of resources, but the connection to nudging was not clear. There also was little connection between the table and the points discussed in the text. See Reviewer 2’s specific point 3 for an idea of how a key table could be more strongly connected to the paper’s main theme.
4. If possible (and if you decide to retain it through the revision), it would be good to get some expert input for the libraries section from a librarian. There are so many services that libraries offer that are relevant to open science, and this section will be richer with a bit of that expertise.

As you see this is a fairly substantial revision that I am requesting, but I believe you are up to the challenge. I will review your resubmission in detail myself, and I may send it back to one or both of the reviewers if needed. We typically ask for revisions to be completed within 6 weeks, but feel free to let me know if you need additional time.

Katie Corker

# Reviewer 1

##### Open response questions

### Please write your review here. The author(s) will see this review. Your identity will not be revealed to the authors unless you also include your name (i.e., sign your review) in this box. It is up to you whether to reveal your identity or not, either is fine.

Cloud link to formatted review document: ‎https://drive.google.com/file/d/16JwwAvCRIIGrt1soKGQhsBsoq7VplRGK/view?usp=sharing ‎

I sign my name as I support reviewer transparency: Gilad Feldman
Thank you for inviting me to review this manuscript. Was surprised just how related this is to my own ‎research. ‎
Editor/authors are welcome to use my review as they please, post/share it etc. I wave any copyright that I ‎might hold to these.‎

Disclosures related to this review and my background, I believe it’s important to state clearly what my ‎expertise is so that editor can take my comments in perspective and authors can decide what they’d like to ‎take away from what I write: ‎
‎1.‎ I am an early career researcher. ‎
‎2.‎ I care greatly about open science and replicable reproducible studies aiming to get things right. My ‎reviewer “code” is posted on: <http://mgto.org/reviewing/> . I myself struggle with the ‎implementation of open-science and transparency, and so I really appreciate any effort invested in ‎this direction, going beyond the topic of research. It is up to us to make a change in our field. ‎
‎3.‎ My comments are NOT meant as criteria for rejection, but rather as our assistance in helping you ‎do better. I aim to help and support you, not hinder you. I offer my review as a guide for ‎improvement, and I am very happy to work with the authors to help them in this journey. They are ‎welcome to reach out to us and ask further questions, and I’ll do my best to help ‎‎(giladfel@gmail.com). I leave it up to the editor to decide on which things s/he thinks is a must for ‎you to implement. I typically aim to see potential in any manuscript, and I believe evidence should ‎be shared openly. ‎
‎4.‎ Disclosure: I have been working on very similar manuscripts and research directions. In my courses ‎I routinely get students to write such opinion pieces, I do workshops on these topics, and I have ‎been hoping to submit this kind of manuscript 😃 I’ll try and mention some of the relevant bits ‎below.‎
‎5.‎ Disclosure: I took part in that workshop at SIPS2019, so it’s obvious I’m biased in favor of this ‎project, and in favor of this manuscript being published. This is an important project. I was hoping ‎to be part of this team and contribute more, yet the team moved much faster than the past year ‎allowed for me to be more involved in this. I am happy to see a draft of this manuscript, and I am ‎hoping that this would be shared with the academic community.‎

I’ll start off with the obvious, I would like to see this project published, but I strongly recommend extra ‎work put in to make this more readable and truly helpful for our community. This has the potential of ‎becoming a very valuable resource.‎

After reading the entire manuscript, twice, here are my impressions and comments.‎
‎ ‎
I think manuscripts like this are important, because they help raise awareness to the promotion of open-‎science. This manuscript supplements several manuscript that have come out on how to promote open-‎science practices (which I generally would have liked to see cited at some point in this manuscript, if they ‎haven’t been cited already):‎
‎1.‎ Moher, D., Bouter, L., Kleinert, S., Glasziou, P., Sham, M. H., Barbour, V., … & Dirnagl, U. (2020). ‎The Hong Kong Principles for assessing researchers: Fostering research integrity. PLoS ‎Biology, 18(7), e3000737.‎
‎2.‎ Allen, C., & Mehler, D. M. (2019). Open science challenges, benefits and tips in early career and ‎beyond. PLoS biology, 17(5), e3000246.‎
‎3.‎ Kathawalla, U. K., Silverstein, P., & Syed, M. (2021). Easing Into Open Science: A Guide for ‎Graduate Students and Their Advisors. Collabra: Psychology, 7(1).‎
‎4.‎ Pownall, M., Talbot, C. V., Henschel, A., Lautarescu, A., Lloyd, K., Hartmann, H., … Siegel, J. A. ‎‎(2020, October 13). Navigating Open Science as Early Career Feminist Researchers. ‎https://doi.org/10.31234/osf.io/f9m47‎
‎5.‎ McKiernan, E. C., Bourne, P. E., Brown, C. T., Buck, S., Kenall, A., Lin, J., … & Yarkoni, T. (2016). ‎Point of view: How open science helps researchers succeed. elife, 5, e16800.‎
‎6.‎ Kowalczyk, O., Lautarescu, A., Blok, E., Dall’Aglio, L., & Westwood, S. (2020). What senior ‎academics can do to support reproducible and open research: a short, three-step guide.‎

The title of this manuscript is about “nudging”, and some of the introduction is trying to position this as ‎nudging. I understand and appreciate the intent here, but it’s not working here. ‎
First off, as a judgment and decision-making scholar, nudging has a specific context and is an often ‎misused term. Most of what’s described in this manuscript is simply not nudging, and by using this term and ‎trying to position this as related to “nudge” is not helping its cause. “nudging” to open-science is something ‎that is related to choice architecture, leveraging heuristics and biases in order to help set a choice set in a ‎way that would make it easier for people to make the “right” choice. There’s a long discussion of what ‎‎"right" is and who gets to decide that, but in the context of this manuscript, I thikn it’s safe to position ‎endorsement of “open science” as the socially desirable behavior we want to encourage. We should also ‎unfortunately acknowledge that current “nudging” goes counter to open-science and research quality. ‎Dorothy Bishop has raised awareness to cognitive biases that are affecting researchers and the research ‎life-cycle (outcome bias, hindsight bias, bias blind spot, confirmation bias, default bias, status-quo bias, ‎inaction-inertia bias, omission bias, belief in the law of small numbers etc.). In that line of research we try ‎to first raise awareness to these cognitive biases and their impact, and then find remedies for overcoming ‎these, some of it by “nudging”. These include things like setting defaults, social norms, public pledges, etc. ‎There are also all kinds of misunderstandings in the way nudging is discussed in the manuscript.‎
Since this manuscript does not tackle these systematically, I suggest moving away from the “nudge” title, ‎and simply replacing that with a more relevant term like “promotion” or “change” of culture/practices/etc, ‎just like the citations above. I also recommend removing everything regarding “nudge” from the ‎manuscript, and start from the culture change paradigms. More on that below.‎
Second, we need to understand what this manuscript offers that complements the above citation, and ‎include that in the title. What I think this manuscript gets right is the mapping of all the relevant ‎stakeholders, with a list of recommendations of what these stakeholders can do to promote a culture ‎change that endorses and practices open-science. Therefore, something like moving from “Nudging Open ‎Science” to "Promoting a cultural change towards open-science: Practical recommendations for ‎stakeholders.‎
Third, I think it’s also very important that the manuscript mentions EAST and Pyramid of Culture Change, ‎and tries to integrate the two at the beginning. Haven’t seen that before, so that nice. I also like how Brian ‎Nosek puts numbers on every stage, and indicates how many are likely to adopt each of those. But ‎throughout the manuscript I was hoping to see how all the recommendations would be mapped to these ‎frameworks, so that it’s clear what this recommendation is targeting, which stage and what target ‎audience. So, these frameworks can help bridge between stakeholders, recommended practices, target ‎audience, and recommended stage of implementations. Some of these paragraphs seem like simply a list ‎of recommended practices, separated by stakeholder sections, but this could be better structured to use ‎these frameworks to indicate what comes first, how one builds on the other, help people assess what ‎stage they’re at, and what target audiences they need to address next. So, I’d like to see more tables ‎and/or figures clearly outlining stakeholders, practices, audiences, implementation stage, based on these ‎frameworks, and to restructure and organize the paragraphs in each section accordingly.‎

I have several other broad recommendations:‎
There are too many statements that are written in informal language and read like an opinion, rather than ‎evidence/fact based recommendation. I would suggest avoiding opinion based statements, and providing ‎as many citations as possible for each sentence to avoid those appearing as if they’re opinions. I don’t ‎think Collabra limits number of citations, so please make use of that. For example: Loose casual writing ‎‎"Why not assign them to write a mock preregistration before conducting a class experiment? They could ‎even post a mock preprint on an internal server for fellow classmates to read and review each other’s ‎work before submitting the revised version for grading.". I understand trying to engage readers, but I ‎would personally prefer that this reads like a well argued science-based position manuscript. Avoid things ‎like “there’s no doubt that…”, simply say what you want to say and provide citations.‎
In a similar fashion, I would suggest avoid those italicized bolding key words that seem to emphasize some ‎keywords over others. These should be used for specific purpose and making a point. Most of the uses I ‎saw for this didn’t seem right.‎
It’s unclear who the target audience for this manuscript is. I would add a paragraph about the readership, ‎who is this is intended for? This seems to shift. Sometimes it reads like the audience is those practicing ‎open-science who wish to encourage others to do the same, and then the stakeholder sections are based ‎on who they’re targeting. But at some points it seems to shift to the broader community, and then the ‎different stakeholders discussed. Adding an aim and a goal for this upfront at the beginning can also help ‎readers in understanding. Since I’m at it, I would also recommend adding a brief lay out of the structure of ‎this document.‎
Similar to the previous paragraph, I would also be very cautious about the use of the plural “we”. Who are ‎these “we”? Whenever possible, please specify who you are referring to. ‎

Building on what I wrote before about stages, in many of the recommendations there’s the need to ‎acknowledge that the current system is still in place and so need to be very careful with advice that ‎counters current practices and disadvantages those who follow it. For example: rather than opting to hide ‎citation metrics, encourage adding credibility information. Or provide different recommendations for ‎different stages of the cultural change pyramid. ‎
One more thing to clarify and be more careful about, which also related to stages, is the difference ‎between adaptation of current system versus change towards optimal system. I would have liked to see ‎this manuscript layout a path of what can be implemented immediately and easily as a temporary remedy, ‎while the longer broader changes are in the works.‎
In addition, the recommendations fall into what more to do (we/they are not doing now) versus what not ‎to do (that they are currently doing now). Given the status quo, I personally try and position my delivery of ‎open-science as “offering services” to help those who want to do better, this way I get much less ‎pushback, and so focusing on “what more to do”. In the “what not to do”, I prefer to hold myself, and the ‎students and collaborators who are working with me, accountable to provide an example. I also try to find ‎ways and educate others as to why what we’re doing is wrong, for those who wish to know more about ‎that. Once there are enough of those, then we can hopefully get to the last stage of the pyramid about ‎enforcing change. I would really be happy to see that happen sooner, and I applaud those who try to do ‎that, but changing what is already status-quo and built strongly into the system is very hard to change. So, ‎for example, Registered Report are ideal, and the way science should be, but only doing Registered ‎Reports by limiting current mainstream confirmatory research of what is currently being published, seems ‎impossible. Perhaps, with time, norms will shift.‎
There is some repetition in the manuscript. Keep things to one place, refer to that place from the other ‎sections if relevant. You can discuss social norms once in the intro, and then there’s no need to again and ‎again say that social norms matter for each section. Same for things like holding workshops, advocating, ‎etc. etc. once, early on, and then refer back to it. ‎
Please avoid generalized statements and try and make things as practical and as concrete as possible. For ‎example, reframe “It may also be fruitful " to concrete strong recommendation, with phases.‎
Whenever possible, please link to open-science examples, templates, and tools. Those beat generalized ‎vague statements any time and are of practical importance. Can have a table with a column for each of ‎those per each practice.‎
I’m a bit biased, but I was a bit surprised to see nothing mentioned about replications. This is the number ‎one tool that I use to drive open-science changes in my community. Not saying it’s a must to be a ‎recommendation, though I’d probably add that as I believe we should all start from replications and ‎extensions, but at the very least mention it somewhere. If you agree this is important, I would appreciate ‎more about that, for all stakeholders.‎
Throughout the manuscript, please, when you refer to open data, make sure it’s clear it’s not just data ‎made available, but long-term reproducible commented code. I would also mention directions such as ‎code review, red teams, etc. since there’s more of that happening for each of the stakeholder categories.‎
Per the specific sections:‎
Researchers
‎"This commitment constrains”, I understand what you’re saying but pre-registration does not constrain, it ‎simply holds us to transparency about what we planned versus what we did. Pre-registration is simply more ‎transparency, so I would start from the broadest recommendation to simply be transparent about ‎everything you do in every stage of the project. The Tables actually do a better job here, just align those.‎
I would hope that pre-registrations would not be devoting a minute or two and there’s no need to position ‎those as such. These should be careful documents that outline your research, you simply shift what you do ‎in a later stage to an earlier stage.‎
I like Tables 2 and 3, but it does make you wonder why we focused on pre-registration here. Why don’t we ‎have tables about misconceptions for all open-science practices. This is one of many places where it feels ‎like (and I know that) different sections where written by different people, and there’s no template of what ‎a section should look like and follow. My general recommendation is that you be consistent in how you ‎structure these sections. If you’re not going to do tables for all practices, then perhaps we can use those ‎tables for a different manuscript about misconceptions. I have similar things on other categories, ‎Chambers has plenty on Registered Reports, which is all to say that I and others in the open-science ‎community would love to help with that and work on broadening these tables to addressing all practices. ‎Bottom line: Just think what belongs here, and what could be a different project, keep things focused here.‎
The section of “Moving from Quantity to Quality and from Data to Theory” is broad, and doesn’t belong to ‎‎"researchers". This should be under a more general section about the research eco-system and assessment ‎of quality, this affects all the stakeholders mentioned in this manuscript. In that section we can discuss all ‎that needs to be done to change the way research and researchers are evaluated, and how this affects all ‎stakeholders. I recommend sticking to practical things and reference on how to achieve those. For ‎example, saying that one must assess the quality of a publication is very broad, too broad. How does one ‎do that? What projects are out there right now to achieve that. We are working on that, you can use our ‎list of resources here: <http://mgto.org/RRRassessment> ‎

Students:‎
Beyond what’s already written, I’ll add:‎
‎1.‎ Students can also be used as initiators for open-science practices. I learn a lot of what I do from ‎my students, and they’ve been a main driver in getting labs to change.‎
‎2.‎ Need to differentiate between just science and open science. Things like training students to ‎analyze scripts doesn’t make them open. Running seminars doesn’t make research open. Focus on ‎open-science, not just education/science in general.‎
‎3.‎ When it comes to adopting R/Python, can offer some advice on how to facilitate that. ‎JAMOVI/JASP seems to be a common easier reproducible solution that runs on R.‎

Libraries:‎
Can help researchers implement the highest open access, by putting latest preprints on public repositories, ‎contacting authors to get them to do this widely, encouraging use of preprint servers and OSF, giving ‎workshops/training in open-access, open-source (R/JASP/JAMOVI, etc.) and implementation of open-‎science. Open science also includes moving to resources/books that are open rather than purchased.‎

Journals:‎
JDM journal is an amazing example of what happens when you force data sharing. They’re not only no-fee ‎open-access, but all articles since the policy started in 2012, I think, have data/code shared. Meta ‎Psychology even does reproducibility checks. Others like Collabra and IRPS are implementing similar ‎measures. Might be good to briefly mention or add list of good examples and citations of sources about ‎the impact of these changes.‎
I would add important things like:‎
‎1.‎ Open accountable peer review, preprint reviews, post publication reviews.‎
‎2.‎ Endorsing policies of quickly addressing concerns over articles, making ensuring reproducibility, ‎error-tracking, and fast updating through retractions simple and mainstream.‎
‎3.‎ Tackling timely dissemination (avoiding the impact factor games journals play with “online first” ‎and then issues 1-2 years later)‎
‎4.‎ Registered Reports should be the main way to go, now moving to public peer review and then ‎publication in any of the supporting journals, the new initiative announced recently. This is the ‎future of publications.‎
‎5.‎ Reviewer based pressure: PRO initiative made a real change, not willing to review unless ‎data/code is shared or explained why it’s not possible.‎
‎6.‎ Reviewers can publicly commit to prioritizing open-science no-fee journals.‎
‎7.‎ Authors can publicly commit to prioritizing open-science no-fee journals over traditional journal. ‎This should be especially easy for senior authors whose careers no longer depend on this model.‎
‎8.‎ I also think journals should structure peer review, working with templates and check lists. See the ‎template I’ve developed for my students doing peer-review on each other: ‎http://mgto.org/reviewpeerreviewtemplate and <http://mgto.org/peerreviewtemplate> ‎

Funding:‎
Registered Reports open-science based funding should be the way to go long term. Win-win for all.‎
Since funds are limited, it was suggested that funding randomizes grants that pass a certain threshold of ‎quality, which Registered Reports open-science would definitely do. At the very least can go for a mixed ‎model, some random, some merit based (on what ever they consider merit).‎

‎=‎
I wrote a lot, but again I want to say that this is an important project, and this is all meant to support you. ‎Happy to discuss further any of this or help in any way I can.‎

Good luck!‎
Gilad

##### Rating scale questions

|  | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| --- | --- | --- | --- | --- | --- |
| The study/studies in this manuscript have strong construct validity (good measures and/or manipulations of the constructs the authors wish to study). (Choose “Neutral” if this is not an empirical manuscript) |  |  | ✔ |  |  |
| The study/studies in this manuscript have strong statistical validity (appropriate statistical tests, assumptions are clear and reasonable, no statistical errors, appropriate statistical inferences, etc.). (Choose “Neutral” if this is not an empirical manuscript) |  |  | ✔ |  |  |
| The study/studies in this manuscript have strong internal validity (any causal claims or implications are well-justified, alternative explanations are thoroughly considered, etc.). (Choose “Neutral” if this is not an empirical manuscript, or no causal claims are made or even vaguely implied.) |  |  | ✔ |  |  |
| The study/studies in this manuscript have strong external validity (authors appropriately constrain their conclusions based on the limits of the generalizability of their findings to other contexts (including from lab to real world), other populations, other stimuli or measures, etc.) |  |  | ✔ |  |  |

##### Reviewer attachments

|  |  |
| --- | --- |
|  | [60888-anonymized-attachment-for-review-277154.docx](https://app.scholasticahq.com/api/v1/attachments/60888/download) |

# Reviewer 2

##### Open response questions

### Please write your review here. The author(s) will see this review. Your identity will not be revealed to the authors unless you also include your name (i.e., sign your review) in this box. It is up to you whether to reveal your identity or not, either is fine.

Review Nudging Open Science

Within their paper, the authors offer a toolbox to assist individuals and institutions in cultivating a more open research culture. By providing recommendations for a wide set of different stakeholders of reproducible science the authors, take a holistic approach and create a summary of the current state of the literature. I believe a paper similar to this could become a go to paper for institutional and individual decision makers. Nevertheless, I am not entirely convinced by the current manuscript. On a general level, I feel that (1) the recommendations do not connected with evidence showing their positive impact on the research process, and (2) the overview feels unsystematic and at places like a random selection of interesting ideas produced by the field. Using the introduced framework for change or making for salient the outcome that is the target of the each intervention and structuring the recommendations along those might help increase the internal flow of the paper. I would like to see respective links in the different sub-chapters. Overall I belive this is a good overview, but I would love to see more creative and out of the box thinking how this paper could become a booster of the ongoing changes itself. Which additional information is needed for that? Could you provide “instruction” lists on how to initiate or sustaine change? Could you maybe even back this up b data? What work, what didnt etc.

Please find below a few more specific points:

1. I am not convinced by the authors presented arguments for pre-prints as a tool for increasing research integrity (and that’s how it reads for me), because of course pre-prints might have more details as the published version, but could also just be less clear and the review process supports authors to become more open and transparent. I strongly agree that pre-prints are a great development, because they foster scientific debate and feedback at an earlier stage in the academic process, but the way it is presented now I as a reader would not see why to change my behavior and publish more pre-prints. I would like to ask the authors to elaborate a bit more on their ideas here.
2. When the authors go into more details on how to nudge researchers to adopt pre-registration and pre-print practices I am not sure that recommendations like organizing seminars, informing researchers about the link between citation rates, pre-print publications, and mock pre-registrations as part of the IRB process etc. are nudges in the original sense. They not only change the choice architecture but providing new information and opportunities for skill development. In addition, it asks for respective commitments and time investments of researchers (e.g. attending open science talks, reproducibiliTea) and hence will result in a strong self-selection. One way the authors might want to go here would be to think about recommendations that scholars can implement in the planning stage of their work. Given that in many work scenarios researchers fall into planning fallacies I would find it very interesting to learn about the authors ideas on how researchers could personally design their work environment (in the planning stage of their academic year/project/phd) that allows them to stick to the formulated goals of Open Science during the stressful times of a project when time pressure and cognitive load would be natural enemies to the originally planned behavior.
3. I would have loved to see a table that summarizes “the toolbox” as a go-to list for each individual stakeholder group. The table would list the recommendations discussed in the text, present one way how to implement/nudge this change and if possible one practical example (with link or description). Such a table would give easy access to interested decision makers who plan to take their first steps in Open Science and provide them with the information needed to convince others in their attempt to generate change.

Minor points:
At some places within the paper I was confused by the structure (why is evaluation part of the researchers node? Why not institutions, reviewers etc.?) hence I would recommend to streamline the paper again.

Please check the manuscript carefully for typos, find some (but not all) examples here:

See reference here: Preregistration and preprints are becoming more and more commonplace (Fu & hughey, 2019; Nosek & Lindsay, 2018).

Simply knowing that other researchers preregister their studies and post preprints, however, does not provide the opportunity for researchers to it themselves.

For example, the fastest way to accumulate publications would be to tweak experiments in minor ways and to write ap a separate article for each of these least publishable units (LPUs; also referred to as ‘salami slicing’).

##### Rating scale questions

|  | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| --- | --- | --- | --- | --- | --- |
| The study/studies in this manuscript have strong construct validity (good measures and/or manipulations of the constructs the authors wish to study). (Choose “Neutral” if this is not an empirical manuscript) |  |  | ✔ |  |  |
| The study/studies in this manuscript have strong statistical validity (appropriate statistical tests, assumptions are clear and reasonable, no statistical errors, appropriate statistical inferences, etc.). (Choose “Neutral” if this is not an empirical manuscript) |  |  | ✔ |  |  |
| The study/studies in this manuscript have strong internal validity (any causal claims or implications are well-justified, alternative explanations are thoroughly considered, etc.). (Choose “Neutral” if this is not an empirical manuscript, or no causal claims are made or even vaguely implied.) |  |  | ✔ |  |  |
| The study/studies in this manuscript have strong external validity (authors appropriately constrain their conclusions based on the limits of the generalizability of their findings to other contexts (including from lab to real world), other populations, other stimuli or measures, etc.) |  |  | ✔ |  |  |

**Author Response**
Aug 25, 2021

**Katie Corker, Editor**

*Collabra: Psychology*

Thank you for the opportunity to resubmit our paper, which we’ve now titled: *Promoting Open Science: A holistic behaviour change.* We found the comments and suggestions from yourself and the reviewers very helpful in improving the paper.

After reading the feedback on the manuscript, we agree that the consistency throughout each section could have been improved, and that the term ‘nudge’ was not the most appropriate way to frame our ideas and recommendations. In light of this feedback, we’ve restructured much of the paper so that the content and suggestions are organised more systematically. We have also moved toward focusing on behaviour change in a general sense rather than focusing specifically on nudging. Below we respond to each individual comment in more detail (all comments are coloured blue, and our responses are coloured black). We thank you and the reviewers for your thoughtful feedback, and we’re confident that our changes have resulted in a much better paper.

Kind regards,

Sam Robson, Myriam Baum, Jennifer Beaudry, Julia Beitner, Jason Chin, Katarzyna Jasko, Ruben Laukkonen, David Moreau, Rachel Searston, Heleen Slagter, Nik Steffens, Jason Tangen and Amberyn Thomas

Dear Samuel and the author team,

Thank you for your submission of “Nudging Open Science” for consideration at Collabra. I read your paper independently before considering the input of two reviewers, both of whom are experts on open science along with behavioral economics. The reviewers and I agreed on many points. We all very much see the promise in your paper, but agree that there are important – and substantial – revisions required. I am going to highlight what I see as the three most crucial points to address, but be aware that these are fairly sizable issues to tackle. In addition to these three main points, I would also like you to respond to each of the reviewers’ points. You do not have to make every change that the reviewers suggest, but I would like you to address each point, explaining why you have or have not opted to make a change.

Thank you for taking the time to read the manuscript and for organising two reviewers as well. We’re happy to hear that you think the manuscript has promise, but we also agree with the vast majority of the suggested revisions. They are very reasonable and have helped us to greatly improve the manuscript. We’ve rewritten and reformatted much of the information and have attempted to improve the coherence and consistency across each section. We’ll outline our major changes in our responses to your comments and reviewer comments below.

Three main points:

1. Both the reviewers and I noted that your use of the term nudging is not well supported and likely needs to be revised. Indeed, as Reviewer 1 notes, nudging is a technical term with associated boundary conditions and theory. Here, you seem to use the term much more loosely. The current usage of the term will be confusing to readers who come to your paper expecting an analysis of open science interventions using nudging principles. For instance, you write “Wrangling data, using sensible variable names, and producing attractive visualisations are other small nudges that go a long way toward making data analyses more interpretable” (p. 19) or “Researchers can nudge departmental chairs (or equivalent) to include explicit statements about open practices in the advertisements they post” (p. 22). As another example – on p. 28, you discuss “the power of defaults.” But these journal policy changes are requirements/mandates, not nudges. None of these applications are nudges in the sense of being changes to choice architecture that encourage desired behaviors. These are just examples, as there are many more instances throughout the paper.

I can see two ways forward here. One option would be to do as Reviewer 1 suggests and eliminate the word nudge from the paper (and its title) to more clearly indicate what the paper actually is about (i.e., suggestions to stakeholders to improve uptake of different open science practices). The other option would be to overhaul the paper to focus more narrowly on proposed nudges. I would want to see a clear, detailed definition (supported with references) of the nudging concept, along with succinct, focused applications of the concept in the open science domain. This would involve cutting a lot (more than half) of the current text and then resituating the paper more directly within the nudging framework. I believe the first option to be more achievable, but the second would be valuable if done extremely well.

We agree that some of the content was not always closely aligned with nudge theory and literature. Indeed, our interpretation of ‘nudging’ was far looser than what most experts in the field would consider applicable. In light of this, we’ve largely adopted the first option you’ve recommended. We have entirely removed the term ‘nudging’ from the paper to avoid confusion among readers. Instead, we remain focused on ways to change behaviour at various nodes in the research ecosystem to improve the uptake of open scientific practices, but we do so in a much broader sense.

The second major issue relates to the structure of the paper. Both reviewers noted, and I agree, that the paper is not well organized. All of us liked the use of different stakeholder groups as an organizing framework for the paper. Yet, we also agreed that revisions would make the paper much more coherent.

We agree with you (and the reviewers) that the structure of the paper was not as coherent as it could be. We have kept the organising framework where we devote a different section to a different stakeholder. However, we have adopted a more consistent structure to increase fluency, which we address below.

There are some inconsistencies within the different stakeholder sections. For instance, the researchers section is several pages long, with large topics (e.g., preregistration) nested within it. Other sections (students, libraries) are much briefer. As noted by Reviewer 2, it’s not clear why a topic like “evaluation” belongs within researchers as opposed to one of the other stakeholder groups (institutions, libraries). Reviewer 1 notes (and I agree) that some topics repeat unnecessarily; for example, I noted at least three mentions of the N-best paper method of evaluation. Finally, the paper also ends rather abruptly with very little in the way of a unifying conclusion.

We agree that resolving some of these inconsistencies greatly improves the manuscript. In each section, we first describe the context of the particular stakeholder group or institution. We then outline several behaviours that the group/stakeholder can engage in to improve scientific practice. Finally, we suggest several ways for the typical researcher or individual to promote these behaviours. We end each section with a table summary of our ideas along with useful resources. Additionally, we draw a distinction between individuals (colleagues and students) and institutions (departments, universities, libraries, journals & funders), which we reason about in the introduction on page 4:

“The primary goal of this paper is to recommend ways in which individual researchers can promote the uptake and maintenance of open practices in others using principles of behaviour change. There are a few key behaviours that we believe are critical to Open Science: preregistration (and registered reports), preprints and open access publication, publicly sharing open and usable data and code, and conducting replication studies. However, the research ecosystem involves many stakeholder groups (both individual and institutional), and there are direct and indirect ways for researchers to encourage others to adopt open practices.

First, researchers can influence other individuals with whom they are in close contact, namely their colleagues and students. Researchers work with other academics and commonly serve as mentors and teachers to thousands of students on their way to becoming the next generation’s researchers and research consumers. In the first part of this paper, we outline actions that researchers can take to directlyinfluence their colleagues and students to adopt open practices.

Of course, researchers and students are heavily influenced by top-down barriers and incentive structures. The policies and practices of institutions may be such that Open Science simply presents a barrier to one’s research goals. If researchers try to influence individuals directly, their actions may have little effect so long as institutions –– departments and faculties, universities, libraries, journals, and funders –– fail to change as well. In the second part of this paper, we focus on how individuals can influence institutions, which will in turn influence the behaviour of researchers and students. In each section, we outline changes that those with institutional decision-making power can directly enact, but most importantly we also recommend ways in which the typical researcher –– even those who do not hold positions of influence –– can increase the likelihood that these decision-makers will enact such changes. For each section, we also provide a table summary with useful online resources.”

With all this said, however, we have devoted more space to the ‘Colleagues’ section (formerly the ‘Researchers’ section) because we believe this to be a key stakeholder and as the first section, it includes many definitions and ideas that set the tone for the remainder of the manuscript. It’s also worth noting that we’ve expanded the Colleagues section to not only include behaviours such as preprints and preregistration, but also behaviours such as sharing open data and code, and conducting replication studies. Additionally, we’ve removed the ‘Evaluation’ section and dispersed it amongst other sections where appropriate, (e.g., Departments/Faculties and Funders). Finally, we have rewritten the conclusion so that it provides a richer and lengthier summary of the manuscript and its goals.

In addition to stakeholders, the two frameworks (pyramid of culture change and EAST) seem like promising anchors to guide the structure of the paper. Yet, they are introduced at the beginning and then barely discussed again. At the outset, I imagined that each proposed nudge would be directly linked to part of one of the frameworks. Reviewer 2 makes a similar point (their Major Point 2).

We’ve kept the EAST and Pyramid of Culture Change frameworks in the manuscript and use these as inspiration when thinking of ways that researchers can effect change at various nodes in the research ecosystem. We’ve noted in the introduction the commonalities between the two frameworks: both recommend that target behaviours be made easy, social and attractive, and anchored our recommendations more clearly with these frameworks in mind.

I hesitate to give strong guidance or direction as to how the paper should be restructured, especially given the two very different directions offered in my first point. Regardless of how you choose to revise, I recommend that you reverse outline the paper to get the big picture of how the different sections fit together and how they tie to your central argument. Reviewer 2’s Specific Point 3 gives another idea for reorganization (they describe a table, but you can extend their suggestion to think about the set up for the paper itself).

We appreciate the suggestions for where we should take this paper. In response, we’ve drastically modified the manuscript to address this point. We hope you and the reviewers find the paper more logical given these changes. We also include a table in section to not only summarise the main ideas and resources, but also to emphasise the consistent structure.

As noted by Reviewer 1, the current draft is not very clear on which topics are areas where you speculate (or give an informed opinion) as opposed to topics for which there is some evidence for a particular practice (either in the nudging literature or in an evaluation of an existing open science practice). Please be clearer in the revision about what the status of the current evidence base is for each proposed nudge/practice. This part is just a suggestion (take or leave), but I could imagine organizing suggested practices as follows: practices that are already in use that likely are effective because of nudging principles (e.g., open science badges) vs. practices that are not yet in use, but might be effective because of nudging principles (e.g., adding fields to journal submission forms to encourage deposit of data or code at submission) vs. practices that are currently in use that are ineffective because they violate nudging principles and therefore need to be revised (e.g., citation counts on CVs).

In line with your suggestions, we’ve removed the term ‘nudge’ from the paper entirely, so our suggestions are no longer grounded specifically in the nudge literature, but instead they more broadly converge with the literature on behavior change and normalization. Some recommendations are grounded in empirical data, or have been suggested by other scholars, and we’ve referenced these where possible. Other suggestions are not directly linked to empirical work, but stem logically from the principles of the two frameworks we introduce at the beginning of the manuscript (EAST and Pyramid of Culture Change).

Additional points of note:

1. The paper as it stands is lengthy, and it includes detailed discussions of topics that are well covered elsewhere. You should feel free to cut with an eye towards reducing lengthy introductions of topics that have been covered in many other reviews.

We have reduced the word count considerably and taken the suggestion to reference many topics that have been covered in other reviews. We have, however, attempted to provide readers enough detail to ensure they can follow our ideas closely.

1. Figure 1 is a bit hard to read. The arrows are not easy to follow, and it relies on color to carry the message. Is there another way to arrange this important figure more clearly?

Thanks for pointing this out –– we’ve altered the colours and arrows in the image to make it easier to understand, and increased the resolution.

1. Depending on how you decide to restructure the paper, I would consider revising or cutting Table 1. This is a nice list of resources, but the connection to nudging was not clear. There also was little connection between the table and the points discussed in the text. See Reviewer 2’s specific point 3 for an idea of how a key table could be more strongly connected to the paper’s main theme.

We have removed Table 1 and have instead included seven separate summary tables (one for each section). Given that we are no longer using nudging as the driving principle in the manuscript, the resources provided in these tables are still useful for individual researchers who want to instigate change.

1. If possible (and if you decide to retain it through the revision), it would be good to get some expert input for the libraries section from a librarian. There are so many services that libraries offer that are relevant to open science, and this section will be richer with a bit of that expertise.

This is a great suggestion. We have approached an experienced librarian to provide richer insights and perspectives to the ‘Libraries’ section. They have also been added as an author. We greatly appreciate all of your feedback.

**Reviewer 1**

I sign my name as I support reviewer transparency: Gilad Feldman

Thank you for inviting me to review this manuscript. Was surprised just how related this is to my own research.

Editor/authors are welcome to use my review as they please, post/share it etc. I wave any copyright that I might hold to these.

Disclosures related to this review and my background, I believe it's important to state clearly what my expertise is so that editor can take my comments in perspective and authors can decide what they'd like to take away from what I write:

1. I am an early career researcher.
2. I care greatly about open science and replicable reproducible studies aiming to get things right. My reviewer "code" is posted on:<http://mgto.org/reviewing/> . I myself struggle with the implementation of open-science and transparency, and so I really appreciate any effort invested in this direction, going beyond the topic of research. It is up to us to make a change in our field.
3. My comments are NOT meant as criteria for rejection, but rather as our assistance in helping you do better. I aim to help and support you, not hinder you. I offer my review as a guide for improvement, and I am very happy to work with the authors to help them in this journey. They are welcome to reach out to us and ask further questions, and I'll do my best to help (giladfel@gmail.com). I leave it up to the editor to decide on which things s/he thinks is a must for you to implement. I typically aim to see potential in any manuscript, and I believe evidence should be shared openly.
4. Disclosure: I have been working on very similar manuscripts and research directions. In my courses I routinely get students to write such opinion pieces, I do workshops on these topics, and I have been hoping to submit this kind of manuscript :) I'll try and mention some of the relevant bits below.
5. Disclosure: I took part in that workshop at [SIPS2019](https://docs.google.com/document/d/19-L9ZqlU6F_-6-j3Z-WWGK0cSfnwYfqAJV_Xx_uOXqY/edit), so it's obvious I'm biased in favor of this project, and in favor of this manuscript being published. This is an important project. I was hoping to be part of this team and contribute more, yet the team moved much faster than the past year allowed for me to be more involved in this. I am happy to see a draft of this manuscript, and I am hoping that this would be shared with the academic community.

I'll start off with the obvious, I would like to see this project published, but I strongly recommend extra work put in to make this more readable and truly helpful for our community. This has the potential of becoming a very valuable resource.

After reading the entire manuscript, twice, here are my impressions and comments.

Thank you for taking the time to read the paper (twice!) and for providing very useful comments and recommendations. It’s great to have a person with your experience provide us with such comprehensive feedback, and we’re happy to hear that you think the manuscript would be a valuable resource for the research community. We think so too, and we’ve put a great deal of effort into improving the readability and coherence of the paper. We hope you agree!

I think manuscripts like this are important, because they help raise awareness to the promotion of open-science. This manuscript supplements several manuscript that have come out on how to promote open-science practices (which I generally would have liked to see cited at some point in this manuscript, if they haven't been cited already):

1. Moher, D., Bouter, L., Kleinert, S., Glasziou, P., Sham, M. H., Barbour, V., ... & Dirnagl, U. (2020). [The Hong Kong Principles for assessing researchers: Fostering research integrity](https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3000737). PLoS Biology, 18(7), e3000737.
2. Allen, C., & Mehler, D. M. (2019). [Open science challenges, benefits and tips in early career and beyond](https://journals.plos.org/plosbiology/article?rev=1&id=10.1371/journal.pbio.3000246). PLoS biology, 17(5), e3000246.
3. Kathawalla, U. K., Silverstein, P., & Syed, M. (2021). [Easing Into Open Science: A Guide for Graduate Students and Their Advisors](https://online.ucpress.edu/collabra/article-abstract/7/1/18684/115927). Collabra: Psychology, 7(1).
4. Pownall, M., Talbot, C. V., Henschel, A., Lautarescu, A., Lloyd, K., Hartmann, H., … Siegel, J. A. (2020, October 13). [Navigating Open Science as Early Career Feminist Researchers](https://psyarxiv.com/f9m47/download?format=pdf).<https://doi.org/10.31234/osf.io/f9m47>
5. McKiernan, E. C., Bourne, P. E., Brown, C. T., Buck, S., Kenall, A., Lin, J., ... & Yarkoni, T. (2016). [Point of view: How open science helps researchers succeed](https://elifesciences.org/articles/16800). elife, 5, e16800.
6. Kowalczyk, O., Lautarescu, A., Blok, E., Dall'Aglio, L., & Westwood, S. (2020). [What senior academics can do to support reproducible and open research: a short, three-step guide](https://psyarxiv.com/jyfr7/download?format=pdf).

Thank you for pointing us to these papers. They are indeed very relevant, and we’ve included them at various points throughout the manuscript. Here are the instances where we have include them:

Page 10: “We summarise our ideas in Table 1 (but see Kowalczyk et al., 2020 for other useful tips and resources).”

Page 11: “Journals now offer Open Science badges to those who preregister or share data (McKiernan et al, 2016).”

Page 11: “...which may be particularly beneficial to early career researchers (Allen & Mehler, 2019; Berg et al., 2016; Pownall et al., 2021; Sarabipour et al., 2019).

Page 13: “Teaching Open Science tools and practices can provide both an engaging learning environment and a coveted skill set (e.g., Kathawalla et al., 2021).”

Page 16: “Many departments and faculties still evaluate researchers based on how regularly one publishes in ‘high-impact’ journals or how frequently their work is cited (Rice et al., 2020).”

Page 19 “...frequent calls for more transparent research practices from journals and funding bodies also indicate that early adoption of Open Science may become more sought after in the near future. Thus, these initiatives might benefit institutional rankings, and in turn attract more funding and demand from prospective students (McKeirnan et al., 2016).”

Page 30: “Finally, editors can increase the visibility and appeal of open practices among researchers by adopting Open Science Badges (McKiernan et al., 2016).”

The title of this manuscript is about "nudging", and some of the introduction is trying to position this as nudging. I understand and appreciate the intent here, but it's not working here.

First off, as a judgment and decision-making scholar, nudging has a specific context and is an often misused term. Most of what's described in this manuscript is simply not nudging, and by using this term and trying to position this as related to "nudge" is not helping its cause. "nudging" to open-science is something that is related to choice architecture, leveraging heuristics and biases in order to help set a choice set in a way that would make it easier for people to make the "right" choice. There's a long discussion of what "right" is and who gets to decide that, but in the context of this manuscript, I think it's safe to position endorsement of "open science" as the socially desirable behavior we want to encourage. We should also unfortunately acknowledge that current "nudging" goes counter to open-science and research quality. Dorothy Bishop has raised awareness to cognitive biases that are affecting researchers and the research life-cycle (outcome bias, hindsight bias, bias blind spot, confirmation bias, default bias, status-quo bias, inaction-inertia bias, omission bias, belief in the law of small numbers etc.). In that line of research we try to first raise awareness to these cognitive biases and their impact, and then find remedies for overcoming these, some of it by "nudging". These include things like setting defaults, social norms, public pledges, etc. There are also all kinds of misunderstandings in the way nudging is discussed in the manuscript.

Since this manuscript does not tackle these systematically, I suggest moving away from the "nudge" title, and simply replacing that with a more relevant term like "promotion" or "change" of culture/practices/etc, just like the citations above. I also recommend removing everything regarding "nudge" from the manuscript, and start from the culture change paradigms. More on that below.

Indeed, the term ‘nudge’ does not capture the goal of the paper and the suggestions that we’ve made in the manuscript. For this reason, we’ve removed the term entirely from the manuscript and instead adopt a broad focus that aims to make desired behaviour easier, more social and more attractive, in line with the two frameworks mentioned early in the manuscript. This change means we have focused on suggestions for behaviour change more generally, rather than limiting our suggestions to nudges. Additionally we have cited Dorothy Bishop’s work on page 5:

“Whether or not individuals and institutions decide to adopt Open Science practices and policies is largely a behavioural question (Bishop, 2020; Norris & O’Connor, 2019).”

Second, we need to understand what this manuscript offers that complements the above citation, and include that in the title. What I think this manuscript gets right is the mapping of all the relevant stakeholders, with a list of recommendations of what these stakeholders can do to promote a culture change that endorses and practices open-science. Therefore, something like moving from "Nudging Open Science" to "Promoting a cultural change towards open-science: Practical recommendations for stakeholders.

We agree that what our manuscript provides clear behaviours (and relevant resources) that can be adopted at many levels in the research ecosystem, including actions that individuals can take to promote these behaviours at many levels. We think that this holistic approach is novel and we’ve changed our title to reflect these strengths and changes. We have titled the manuscript: *Promoting Open Science: A holistic behaviour change approach.*

Third, I think it's also very important that the manuscript mentions EAST and Pyramid of Culture Change, and tries to integrate the two at the beginning. Haven't seen that before, so that nice. I also like how Brian Nosek puts numbers on every stage, and indicates how many are likely to adopt each of those. But throughout the manuscript I was hoping to see how all the recommendations would be mapped to these frameworks, so that it's clear what this recommendation is targeting, which stage and what target audience. So, these frameworks can help bridge between stakeholders, recommended practices, target audience, and recommended stage of implementations. Some of these paragraphs seem like simply a list of recommended practices, separated by stakeholder sections, but this could be better structured to use these frameworks to indicate what comes first, how one builds on the other, help people assess what stage they're at, and what target audiences they need to address next. So, I'd like to see more tables and/or figures clearly outlining stakeholders, practices, audiences, implementation stage, based on these frameworks, and to restructure and organize the paragraphs in each section accordingly.

We’re glad to hear that you liked the two frameworks we use to ground our ideas and suggestions. We have restructured each section so that we can more clearly situate our ideas around the principles of these frameworks: make it easy, make it attractive, make It social. In each section, we explain the role and goals of the group/stakeholder, outline potential behaviours that can be enacted, and then outline what researchers can do to promote these changes. We outline this new structure at several points in the manuscript:

Page 6: “Individual researchers ultimately determine how scientific studies are conducted; they design the experiments, gather the data, and write up the results. Here, we suggest several open practices that individuals can readily adopt ––preregistration, preprints, open data and code, and replication –– and then we recommend ways in which researchers can influence colleagues and students to adopt these practices using principles of make it easy, make it social, and make it attractive. We first turn our attention to colleagues, and then to students.”

Page 16: “For each institution, we describe their role in research, and then we outline several target behaviours that the institution can implement to influence researchers and students to adopt open practices. Some researchers may have direct decision-making power and they might find these ideas valuable because they have considerable sway in enacting such policies and practices. However, many researchers do not hold positions of considerable influence. We therefore end each section with recommended actions that the typical researcher –– even those who might not hold positions of influence –– can take to affect institutional change. Of course, this is not an exhaustive list, but we aim to provide a few concrete ways for individual researchers to *indirectly* influence scientific norms and practices by targeting institutional change in whatever capacity. Again, we take inspiration from the principles of making behaviours easy, social, and attractive.”

We’ve also separated individuals (colleagues and students) from institutions (departments, universities, libraries, journals and funders) for reasons we express on Page 4:

“First, researchers can influence other individuals with whom they are in close contact, namely their colleagues and students. Researchers work with other academics and commonly serve as mentors and teachers to thousands of students on their way to becoming the next generation’s researchers and research consumers. In the first part of this paper, we outline actions that researchers can take to directlyinfluence their colleagues and students to adopt open practices.

Of course, researchers and students are heavily influenced by top-down barriers and incentive structures. The policies and practices of institutions may be such that Open Science simply presents a barrier to one’s research goals. If researchers try to influence individuals directly, their actions may have little effect so long as institutions –– departments and faculties, universities, libraries, journals, and funders –– fail to change as well. In the second part of this paper, we focus on how individuals can influence institutions, which will in turn influence the behaviour of researchers and students. In each section, we outline changes that those with institutional decision-making power can directly enact, but most importantly we also recommend ways in which the typical researcher –– even those who do not hold positions of influence –– can increase the likelihood that these decision-makers will enact such changes. For each section, we also provide a table summary with useful online resources.”

I have several other broad recommendations:

There are too many statements that are written in informal language and read like an opinion, rather than evidence/fact based recommendation. I would suggest avoiding opinion based statements, and providing as many citations as possible for each sentence to avoid those appearing as if they're opinions. I don't think Collabra limits number of citations, so please make use of that. For example: Loose casual writing "Why not assign them to write a mock preregistration before conducting a class experiment? They could even post a mock preprint on an internal server for fellow classmates to read and review each other’s work before submitting the revised version for grading.". I understand trying to engage readers, but I would personally prefer that this reads like a well argued science-based position manuscript. Avoid things like "there's no doubt that...", simply say what you want to say and provide citations.

We largely agree with this point and have rewritten much of the manuscript, taking note of any instances where our language is too informal.

In a similar fashion, I would suggest avoid those italicized bolding key words that seem to emphasize some keywords over others. These should be used for specific purpose and making a point. Most of the uses I saw for this didn't seem right.

Again, we think this is a good suggestion and we’ve removed most instances where words have been italicised or bolded.

It's unclear who the target audience for this manuscript is. I would add a paragraph about the readership, who is this is intended for? This seems to shift. Sometimes it reads like the audience is those practicing open-science who wish to encourage others to do the same, and then the stakeholder sections are based on who they're targeting. But at some points it seems to shift to the broader community, and then the different stakeholders discussed. Adding an aim and a goal for this upfront at the beginning can also help readers in understanding. Since I'm at it, I would also recommend adding a brief lay out of the structure of this document.

We very much agree that readers would be confused with the way the ideas were structured. We’ve outlined our goals and target audience and rationale more clearly as you can see in the paragraphs above to clarify these points.

Similar to the previous paragraph, I would also be very cautious about the use of the plural "we". Who are these "we"? Whenever possible, please specify who you are referring to.

We take your point ‘we’ is ambiguous in many cases. Rather than avoiding it altogether, we have decided only to use it when we as authors are making suggestions because writing in first-person can improve the writing style. However, we have reworded those instances where we used the collective ‘we’, as in ‘we’ as the research community to remove ambiguity.

Building on what I wrote before about stages, in many of the recommendations there's the need to acknowledge that the current system is still in place and so need to be very careful with advice that counters current practices and disadvantages those who follow it. For example: rather than opting to hide citation metrics, encourage adding credibility information. Or provide different recommendations for different stages of the cultural change pyramid.

This is a good point and something we very much considered when writing the manuscript, but we agree that we could take more care with this. Below is an excerpt from the manuscript where we frame our recommendation as something that can be added rather than hidden or removed in a way that disadvantages researchers. For instance, see this excerpt from page 31:

“It is also common for university research offices to edit grant proposals to highlight traditional research metrics. However, researchers can take it upon themselves to also highlight their five or ten ‘Best’ papers, to write a written statement of one’s broader impact, or to use less traditional metrics such as Altmetric.”

One more thing to clarify and be more careful about, which also related to stages, is the difference between adaptation of current system versus change towards optimal system. I would have liked to see this manuscript layout a path of what can be implemented immediately and easily as a temporary remedy, while the longer broader changes are in the works.

Thank you for this suggestion. Given our new structure, and the organising framework, rather than drawing a distinction between near-term and long-term actions, we focus instead on the distinction between behaviours that the institution or group can adopt, and the immediate actions that individual researchers can take to initiate these changes even if they might not have direct decision-making power (as indicated in the paragraphs above). In doing so, we make clear recommendations that can help the research community transition toward more transparent practices in a variety of different ways. We think this is is effective because different people and different departments may be at various stages in terms of how open their culture is, or their particular local context, and the immediate individual actions we suggest are general enough to be useful in many different contexts.

In addition, the recommendations fall into what more to do (we/they are not doing now) versus what not to do (that they are currently doing now). Given the status quo, I personally try and position my delivery of open-science as "offering services" to help those who want to do better, this way I get much less pushback, and so focusing on "what more to do". In the "what not to do", I prefer to hold myself, and the students and collaborators who are working with me, accountable to provide an example. I also try to find ways and educate others as to why what we're doing is wrong, for those who wish to know more about that. Once there are enough of those, then we can hopefully get to the last stage of the pyramid about enforcing change. I would really be happy to see that happen sooner, and I applaud those who try to do that, but changing what is already status-quo and built strongly into the system is very hard to change. So, for example, Registered Report are ideal, and the way science should be, but only doing Registered Reports by limiting current mainstream confirmatory research of what is currently being published, seems impossible. Perhaps, with time, norms will shift.

We agree that our goal ought to be offering services to individuals and institutions. With our new structure, we think the manuscript achieves this goal. We think our recommendations will lead to gradual shifts in research norms because we offer specific actions and resources for individuals to promote these shifts at various levels. We summarise this in the conclusion on page 33:

“Our aim in this paper was to provide recommendations and resources that the everyday researcher can use to promote Open Science by targeting various nodes in the research ecosystem. For each stakeholder group, we have explained how current behaviours, norms, and cultures sustain irreproducibility –– thus slowing scientific progress –– and we suggest alternative behaviours and practices that are more conducive to Open Science. However, most critically, we ended each section by recommending how individual researchers can advance such changes, and we used two behaviour change frameworks to do so: EAST and the Pyramid of Culture Change. In essence, these frameworks argue that, for behaviours to be adopted, they ought to be made easy, social, and attractive.

We first proposed ways in which researchers can directly influence open practices by targeting individuals with whom they work closely–– colleagues and students. However, progress often also hinges on top-down influences from larger institutions and without any pressure on institutions from researchers themselves, there will be little demand driving such change. In the second part of this paper, we suggested ways in which institutions –– departments and faculties, universities, libraries, journals, and funders –– can advance open practices. We also suggested ways that everyday researchers can influence these institutions despite not having direct decision-making power. Practices across the scientific community determine the quality of the research that is generated and disseminated. A holistic approach to improving the infrastructure, norms, and reward structures is needed to shift to a culture of Open Science. Inspired by principles of behaviour change, we hope to have provided useful means to empower researchers to do so.”

There is some repetition in the manuscript. Keep things to one place, refer to that place from the other sections if relevant. You can discuss social norms once in the intro, and then there's no need to again and again say that social norms matter for each section. Same for things like holding workshops, advocating, etc. etc. once, early on, and then refer back to it.

There was certainly some repetition in the original manuscript, and I suppose this was because certain topics (e.g., evaluation) apply to many different stakeholders. In restructuring the paper, we have attempted to remove these redundancies by focusing on behaviours and actions specific to each stakeholder. For example, many of the recommendations for evaluation are discussed with respect to Departments and Faculties, but under ‘Funders’ we also talk specifically about the evaluation regarding grant proposals. Finally, though we mention social norms in the introduction, the two frameworks––Pyramid of Culture Change and EAST–– thread each section together so we think it’s important to refer to changing norms throughout many sections to emphasise that the action is leveraging ‘make it social’

Please avoid generalized statements and try and make things as practical and as concrete as possible. For example, reframe "It may also be fruitful " to concrete strong recommendation, with phases. Whenever possible, please link to open-science examples, templates, and tools. Those beat generalized vague statements any time and are of practical importance. Can have a table with a column for each of those per each practice.

We agree that we should avoid generalised statements and have replaced these where possible in the manuscript. For example, here is an excerpt from page 18:

“For instance, one can serve on an ethics subcommittee to promote preregistration and open data plans in ethical review processes, they can serve on a teaching and learning subcommittee to promote Open Science education in students, and they can serve on hiring panels and committees to promote changes to researcher evaluation.”

We’ve also split the very large table we had in our original manuscript into seven separate tables (one for each section) where we include helpful links that are specific to each section.

I'm a bit biased, but I was a bit surprised to see nothing mentioned about replications. This is the number one tool that I use to drive open-science changes in my community. Not saying it's a must to be a recommendation, though I'd probably add that as I believe we should all start from replications and extensions, but at the very least mention it somewhere. If you agree this is important, I would appreciate more about that, for all stakeholders.

We originally planned to focus only on preregistration and preprints and a small set of concrete behaviours that researchers can adopt. However, we have since broadened our scope to include open data and code, and replication as well. Here is the excerpt from the ‘Colleagues’ section on Page 9:

“Remedying irreproducibility requires ways to assess whether a phenomenon or effect is replicable. That is, whether the finding is stable and/or generalisable. If a finding is not replicable, it cannot advance scientific thinking, and without replication studies, strong theories that map on well to statistical models are unlikely to develop (Fiedler, 2017; Szollosi et al., 2019). To replicate the work of others, researchers can follow the very same procedures that were used originally and see whether they too find similar findings (direct replication) or take a theory or effect and see if it reoccurs in novel circumstances or populations (conceptual replication; Zwaan et al., 2018). Of course, the capacity to conduct replication studies hinges on open access to papers, data, and analyses, yet again highlighting the benefits of such practices.”

We also refer to replication at several other points in the manuscript, such as in the ‘Journals’ section on page 28:

“For example, journals can adopt Registered Reports as a submission format (Nosek & Lakens, 2014) and encourage authors to submit replications.”

Throughout the manuscript, please, when you refer to open data, make sure it's clear it's not just data made available, but long-term reproducible commented code. I would also mention directions such as code review, red teams, etc. since there's more of that happening for each of the stakeholder categories.

This is an important point. We mention FAIR principles when introducing open data and code in the ‘Colleagues’ section to ensure that readers are aware of what sharing data ought to entail, and we also include a link where readers can learn more about FAIR data in Table 1. However, given the length and scope of the paper, we’ve decided not to include more specific suggestions about code review and red teams. Here is an excerpt that speaks specifically to this point about FAIR data on page 9:

“…Sharing data and code can enable others to verify the appropriateness of a study’s data and analyses, and to check for errors (Klein et al., 2018). Moreover, sharing data and code can make research more reproducible if researchers ensure that the data is findable, accessible, interoperable, and reusable (FAIR; see Wilkinson et al., 2016). Of course, explaining why sharing certain data is not feasible or ethical also aligns with transparent practice.”

Per the specific sections:

Researchers

"This commitment constrains", I understand what you're saying but pre-registration does not constrain, it simply holds us to transparency about what we planned versus what we did. Pre-registration is simply more transparency, so I would start from the broadest recommendation to simply be transparent about everything you do in every stage of the project. The Tables actually do a better job here, just align those.

Thank you for drawing our attention to this. We’ve removed the tables but have cleared this phrasing in revising the text. See page 7:

“Preregistration is a commitment to one’s research planning decisions, including predictions, recruitment strategies, exclusion criteria, stopping rules, materials, procedures, study design, and analyse, without advanced knowledge of a study’s outcomes (DeHaven, 2017; Gelman & Loken, 2013; Nosek et al., 2018). This commitment means that researchers must demarcate between confirmatory and exploratory decisions, analyses, and findings. Although some have questioned the utility of preregistration (see Devezer et al., 2020; Szollosi et al., 2019), shifting decisions about theory and study design to earlier in the research process helps to ensure that unforeseeable issues with an experiment are addressed early.”

I would hope that pre-registrations would not be devoting a minute or two and there's no need to position those as such. These should be careful documents that outline your research, you simply shift what you do in a later stage to an earlier stage.

We agree, and perhaps there was some confusion here. Our intention was not to advocate that researchers only devote a minute or two to when writing a preregistration, but merely to take a brief moment in presentations (on other topics) to signal that they in fact had preregistered the relevant study before collecting data. This act, if done regularly by a large number of people, would signal that preregistration is the norm and might encourage others to follow suit. We hope to have cleared this up in the manuscript, and the relevant lines now read as follows on page 11:

“Additionally, researchers can use conference talks, poster presentations, and lab meetings as opportunities to highlight an instance where they have preregistered a study, made data publicly available, or posted the relevant preprint. Signalling these practices will serve as a social norm.”

I like Tables 2 and 3, but it does make you wonder why we focused on pre-registration here. Why don't we have tables about misconceptions for all open-science practices. This is one of many places where it feels like (and I know that) different sections where written by different people, and there's no template of what a section should look like and follow. My general recommendation is that you be consistent in how you structure these sections. If you're not going to do tables for all practices, then perhaps we can use those tables for a different manuscript about misconceptions. I have similar things on other categories, Chambers has plenty on Registered Reports, which is all to say that I and others in the open-science community would love to help with that and work on broadening these tables to addressing all practices. Bottom line: Just think what belongs here, and what could be a different project, keep things focused here.

We greatly appreciate this advice. We have thought more about the scope of this paper and have revised the manuscript so that the structure of each section is more consistent. We have also decided to remove Tables 2 and 3 for this reason and because we have moved away from focusing solely on preregistration and preprints.

The section of "Moving from Quantity to Quality and from Data to Theory" is broad, and doesn't belong to "researchers". This should be under a more general section about the research eco-system and assessment of quality, this affects all the stakeholders mentioned in this manuscript. In that section we can discuss all that needs to be done to change the way research and researchers are evaluated, and how this affects all stakeholders. I recommend sticking to practical things and reference on how to achieve those. For example, saying that one must assess the quality of a publication is very broad, too broad. How does one do that? What projects are out there right now to achieve that. We are working on that, you can use our list of resources here:<http://mgto.org/RRRassessment>

Thank you for this useful feedback. We have moved this section under ‘Departments and Faculties’ and given it a major revision. In the revised version, beginning on page 16 through to 18, we provide much more concrete examples for how institutions can promote ‘quality’, open research practices, and describe what is meant by quality. For example, we provide concrete metrics that a hiring committee can use to ensure that prospective applicants are incentivised toward Open Science. A relevant excerpt from page 17-18:

“...Rather than demonstrating the number of publications or citations, candidates ought to be asked to comment on the quality and likely replicability of their publications, and the steps they have taken to increase transparency and contribute to science more broadly. Candidates, for example, could be asked to submit an annotated CV detailing preregistrations, replication, open data and code, power analyses, theoretical motivations, and experimental designs with (active) control groups. In fact, the dissertations of postgraduate students could be evaluated in similar ways. These circumstances are likely to encourage researchers to reconsider their practices and signal that such practices are widespread and highly valued (Nosek, 2019). For those interested more in criteria for researchers’ assessment, Moher and colleagues (2020) review contemporary critiques of the status quo (e.g., DORA, 2012, the Leiden Manifesto, 2015). Gernsbacher (2018) also provides specific recommendations for how to reward open practices.”

Students:

Beyond what's already written, I'll add:

1. Students can also be used as initiators for open-science practices. I learn a lot of what I do from my students, and they've been a main driver in getting labs to change.
2. Need to differentiate between just science and open science. Things like training students to analyze scripts doesn't make them open. Running seminars doesn't make research open. Focus on open-science, not just education/science in general.
3. When it comes to adopting R/Python, can offer some advice on how to facilitate that. JAMOVI/JASP seems to be a common easier reproducible solution that runs on R.

Thank you for these suggestions. We have addressed your first point on Page 13:

“Students also have fewer research habits to unlearn and can serve as a conduit for change among more senior researchers who might face the added inertia of bedded down practices. If so, students might benefit from the suggestions we provide in the previous section in swaying others to adopt transparent research behaviours.”

With respect to your second and third points, we’ve made it clearer in the ‘Students’ section, and throughout the paper, that sharing open data and code is an important cornerstone of Open Science, and we have tailored the ‘Students’ section to reflect this. Here is an excerpt from page 14:

“Teachers can further habituate students to create interpretable and reusable code and statistical skills inside and outside of the classroom. Students ought to be introduced to open-source statistical programming languages such as Python and R. Proficiency in these computing languages, and user-friendly open software built on them, provides students with the means to share and document their analysis scripts for others to review and reuse. Moreover, teachers can impart ways of writing code and running analysis scripts with detailed commentary so that errors or inconsistencies in are easy to discover. Wrangling data into ‘tidy’ or more readable formats, using sensible variable names, and producing attractive visualisations are other small steps that make analyses and results more interpretable and accessible.”

Libraries:

Can help researchers implement the highest open access, by putting latest preprints on public repositories, contacting authors to get them to do this widely, encouraging use of preprint servers and OSF, giving workshops/training in open-access, open-source (R/JASP/JAMOVI, etc.) and implementation of open-science. Open science also includes moving to resources/books that are open rather than purchased.

These are some great suggestions. However, in light of other comments, we’ve completely revised the ‘Library’ section and taken a new perspective after bringing a librarian on board with considerable knowledge in this area.

Journals:

JDM journal is an amazing example of what happens when you force data sharing. They're not only no-fee open-access, but all articles since the policy started in 2012, I think, have data/code shared. Meta Psychology even does reproducibility checks. Others like Collabra and IRPS are implementing similar measures. Might be good to briefly mention or add list of good examples and citations of sources about the impact of these changes.

I would add important things like:

1. Open accountable peer review, preprint reviews, post publication reviews.
2. Endorsing policies of quickly addressing concerns over articles, making ensuring reproducibility, error-tracking, and fast updating through retractions simple and mainstream.
3. Tackling timely dissemination (avoiding the impact factor games journals play with "online first" and then issues 1-2 years later)
4. Registered Reports should be the main way to go, now moving to public peer review and then publication in any of the supporting journals, the new initiative announced recently. This is the future of publications.
5. Reviewer based pressure: PRO initiative made a real change, not willing to review unless data/code is shared or explained why it's not possible.
6. Reviewers can publicly commit to prioritizing open-science no-fee journals.
7. Authors can publicly commit to prioritizing open-science no-fee journals over traditional journal. This should be especially easy for senior authors whose careers no longer depend on this model.
8. I also think journals should structure peer review, working with templates and check lists. See the template I've developed for my students doing peer-review on each other:<http://mgto.org/reviewpeerreviewtemplate> and<http://mgto.org/peerreviewtemplate>

Thank you very much for your detailed and constructive thoughts and input. In line with your suggestions here (and other suggestions by the editor), we’ve restructured and revised the ‘Journals’ section to highlight each of these points (pages 27-29). We have not incorporated point 3 as it is our sense that impact factors (even if constructed timely) have in and of themselves limited informational value for open science and do not provide a good indication of the quality (or openness) of published work and so we focused on discussing other ways that may help promote openness and transparency in the research process.

Funding:

Registered Reports open-science based funding should be the way to go long term. Win-win for all.

Since funds are limited, it was suggested that funding randomizes grants that pass a certain threshold of quality, which Registered Reports open-science would definitely do. At the very least can go for a mixed model, some random, some merit based (on whatever they consider merit).

We largely agree with this point and have alluded to it on Page 31:

“Perhaps in the long-term, funders should be randomising grants that pass a certain threshold of quality where quality encompasses strong theory and a commitment to open practices and Registered Reports.”

I wrote a lot, but again I want to say that this is an important project, and this is all meant to support you. Happy to discuss further any of this or help in any way I can.

Good luck!

Thank you immensely for the time and effort you have given to read and provide feedback on this manuscript. We hope that our revisions have addressed many issues that you raise, and that the revised manuscript is worthy of publication.

**Reviewer 2**

Review Nudging Open Science

Within their paper, the authors offer a toolbox to assist individuals and institutions in cultivating a more open research culture. By providing recommendations for a wide set of different stakeholders of reproducible science the authors, take a holistic approach and create a summary of the current state of the literature. I believe a paper similar to this could become a go to paper for institutional and individual decision makers. Nevertheless, I am not entirely convinced by the current manuscript.

Thank you for taking the time to read the manuscript. It’s fantastic to hear that you think the manuscript could be the go-to paper for decision making at individual and institutional levels. We agree largely with many of your critiques and have attempted to remedy these in our revisions. We hope you agree that the changes have clarified some of the issues that you raise, and that these changes have substantially improved the manuscript.

 On a general level, I feel that (1) the recommendations do not connected with evidence showing their positive impact on the research process, and (2) the overview feels unsystematic and at places like a random selection of interesting ideas produced by the field. Using the introduced framework for change or making for salient the outcome that is the target of the each intervention and structuring the recommendations along those might help increase the internal flow of the paper. I would like to see respective links in the different sub-chapters. Overall I belive this is a good overview, but I would love to see more creative and out of the box thinking how this paper could become a booster of the ongoing changes itself. Which additional information is needed for that? Could you provide “instruction” lists on how to initiate or sustaine change? Could you maybe even back this up b data? What work, what didnt etc.

In revising our manuscript, we have restructured many sections so that there is more consistency throughout. We have divided the manuscript into two parts: ‘Individuals’ and ‘Institutions’, and each part is divided into several sections, each targeting a specific stakeholder or group, as was the case in our original submission. However, each section now has a more consistent structure. This new structure and focus means that the ideas are more systematic. In addition, we support many of our claims throughout the paper with references where possible. Of course, some of ideas are not directly backed by empirical evidence, such as our recommended researcher actions, but we ground these ideas in the behaviour change principles we introduce in the introduction (EAST and the Pyramid of Culture Change; Make it easy, make it social, make it attractive). We have not provided an explicit instruction list, but we now end each section with a table outlining important behaviours that each stakeholder can adopt, researcher actions to promote these behaviours, and a list of resources for assisting these initiatives. Here is an excerpt from page 4 below detailing our aims and the reasoning behind our revised structure.

“The primary goal of this paper is to recommend ways in which individual researchers can promote the uptake and maintenance of open practices in others using principles of behaviour change. There are a few key behaviours that we believe are critical to Open Science: preregistration (and registered reports), preprints and open access publication, publicly sharing open and usable data and code, and conducting replication studies. However, the research ecosystem involves many stakeholder groups (both individual and institutional), and there are direct and indirect ways for researchers to encourage others to adopt open practices.

First, researchers can influence other individuals with whom they are in close contact, namely their colleagues and students. Researchers work with other academics and commonly serve as mentors and teachers to thousands of students on their way to becoming the next generation’s researchers and research consumers. In the first part of this paper, we outline actions that researchers can take to directlyinfluence their colleagues and students to adopt open practices.

Of course, researchers and students are heavily influenced by top-down barriers and incentive structures. The policies and practices of institutions may be such that Open Science simply presents a barrier to one’s research goals. If researchers try to influence individuals directly, their actions may have little effect so long as institutions –– departments and faculties, universities, libraries, journals, and funders –– fail to change as well. In the second part of this paper, we focus on how individuals can influence institutions, which will in turn influence the behaviour of researchers and students. In each section, we outline changes that those with institutional decision-making power can directly enact, but most importantly we also recommend ways in which the typical researcher –– even those who do not hold positions of influence –– can increase the likelihood that these decision-makers will enact such changes. For each section, we also provide a table summary with useful online resources.”

Please find below a few more specific points:

1. I am not convinced by the authors presented arguments for pre-prints as a tool for increasing research integrity (and that’s how it reads for me), because of course pre-prints might have more details as the published version, but could also just be less clear and the review process supports authors to become more open and transparent. I strongly agree that pre-prints are a great development, because they foster scientific debate and feedback at an earlier stage in the academic process, but the way it is presented now I as a reader would not see why to change my behavior and publish more pre-prints. I would like to ask the authors to elaborate a bit more on their ideas here.

We have broadened the scope of the ‘Colleagues’ Section (formerly the ‘Researchers’ section) to include behaviors beyond just preregistration and preprints. However, we still think preprints (and Open Access publications) are an integral part of Open Science. We agree that we needed to further elaborate on the benefits of preprints, keeping in mind that our goal of this manuscript is not necessarily to convince readers to adopt certain practices, but to provide ways and means for the typical researcher to influence individuals and institutions around them to adopt transparent research behaviours. Here is an excerpt from pages 8-9 regarding preprints:

“Expanding scientific knowledge rests on individuals having access to a broad range of research products so that anyone can build on prior work. Behaviours relating to publishing and disseminating one’s research therefore affect knowledge creation. One can make their work Open Access (OA) either by making articles freely accessible at the point of publication (see the ‘Libraries’ section), or by self-archiving either the published article or the author’s version of the accepted manuscript (Harnad et al., 2008).A preprint is a form of self-archiving where one posts a version of a scientific paper before it is formally peer-reviewed in a scholarly journal and is often made publicly available. Sharing preprints is becoming increasingly popular for many researchers (Narock & Goldstein, 2019; Berg et al., 2016).

Peer review is an integral aspect of science and some raise concerns about the lack of quality control in non-peer-reviewed manuscripts such as preprints (see Bauchner, 2017, Maslove, 2018). Nonetheless, knowing that a preprint has not been peer-reviewed might incentivise readers to be more critical and sceptical of a study (Velterop, 2016). More eyes on a manuscript might also improve replicability because researchers can be notified about errors, alternative interpretations, or logical flaws before formal publication (Oakden-Rayener et al., 2018). Posting preprints of null or negative findings can also alleviate the ‘file-drawer’ problem by giving a platform to results that may not be palatable for formal publication (Verma, 2017). Some have also suggested that preprints be used as a platform for open peer review (Saderi & Greaves, 2021). A recent initiative (PCI; see Table 1) provides such a platform, arranging peer review and requiring a recommendation before preprints are posted. Authors then have the option to submit their ‘accepted’ preprint to a traditional journal.”

1. When the authors go into more details on how to nudge researchers to adopt pre-registration and pre-print practices I am not sure that recommendations like organizing seminars, informing researchers about the link between citation rates, pre-print publications, and mock pre-registrations as part of the IRB process etc. are nudges in the original sense. They not only change the choice architecture but providing new information and opportunities for skill development. In addition, it asks for respective commitments and time investments of researchers (e.g. attending open science talks, reproducibiliTea) and hence will result in a strong self-selection. One way the authors might want to go here would be to think about recommendations that scholars can implement in the planning stage of their work. Given that in many work scenarios researchers fall into planning fallacies I would find it very interesting to learn about the authors ideas on how researchers could personally design their work environment (in the planning stage of their academic year/project/phd) that allows them to stick to the formulated goals of Open Science during the stressful times of a project when time pressure and cognitive load would be natural enemies to the originally planned behavior.

We largely agree with this comment, and considering your (and others’) recommendations, we have decided to remove the theme of nudging from the manuscript. Instead, we’ve adopted a broader focus on behaviour change that remains informed by the two frameworks we introduce at the beginning, but our suggestions are no longer specific to nudging. However, rather than focus on providing tips for the planning stages of one’s work, our goal is to provide researchers who are already committed to Open Science with the strategies and means to influence other individuals and institutions. Nonetheless, the self-nudging idea you’ve propose might be a worthwhile idea for another paper!

1. I would have loved to see a table that summarizes “the toolbox” as a go-to list for each individual stakeholder group. The table would list the recommendations discussed in the text, present one way how to implement/nudge this change and if possible one practical example (with link or description). Such a table would give easy access to interested decision makers who plan to take their first steps in Open Science and provide them with the information needed to convince others in their attempt to generate change.

We think this table summary idea is great. We have decided to include a table at the end of each section. However, we’ve now moved away from nudging and taken a more general behaviour change approach. Thus, our tables are there to summarise key points and provide useful online resources (i.e., the toolbox). We think these summary tables will provide readers with clear and actionable steps and resources to implementing change.

Minor points: At some places within the paper I was confused by the structure (why is evaluation part of the researchers node? Why not institutions, reviewers etc.?) hence I would recommend to streamline the paper again.

As we mentioned, in revising the manuscript, we’ve made each section more consistent in terms of structure. Many of the ideas surrounding evaluation have been moved to the ‘Departments and Faculties’ section, but some specific ideas surrounding grant proposals and journal review are also included elsewhere. In making these changes, we think the manuscript is also far more coherent, so we appreciate your feedback.

Please check the manuscript carefully for typos, find some (but not all) examples here:

See reference here: Preregistration and preprints are becoming more and more commonplace (Fu & hughey, 2019; Nosek & Lindsay, 2018).

Simply knowing that other researchers preregister their studies and post preprints, however, does not provide the opportunity for researchers to it themselves.

For example, the fastest way to accumulate publications would be to tweak experiments in minor ways and to write ap a separate article for each of these least publishable units (LPUs; also referred to as ‘salami slicing’).

Thank you for pointing these specific instances out. As we have revised much of the manuscript and hope to have removed any such errors in the revised version. Thanks again, for taking the time to review this manuscript.

**Editor Final Decision: Revise & Resubmit**

Nov 11

Dear Samuel and Team,

Thank you for your resubmission of “Promoting Open Science: A Holistic Approach to Changing Behavior.” You have done a superb job with the revision. It is now much clearer what the unique contribution of this paper is. It does a great job organizing both individual behaviors and systemic changes that researchers can make to increase uptake of open science practices. I really liked the revised Figure 1 and the new tables. You should consider your paper accepted, pending a few small (but required) changes:

1. Please use stable web links (especially in your tables) whenever possible. Most links go directly to various organizations current webpages, and this is good. Some links go to more ephemeral resources (google docs, youtube videos). For those resources, can you please ask the authors to post a stable version of the document somewhere with a DOI (such as OSF or Figshare)? Alternatively, you could create a stable version of the content using [archive.org](http://archive.org/).
2. The YouTube link in Table 5 should be to the website for the documentary instead of YouTube (and include a citation in the reference list).

Typos:

* p. 19, “Such metrics and rankings influence how funds are allocated and (among other things) enrolments from fee paying domestic and international students (Harvey, 2008; Hurley, 2021; Nietzel, 2021).” Should “are used” be appended to the end of the sentence?
* Table 4: Adopt OSF for Institutions
* Unfinished sentence at the top of p. 23.
* Typo, Table 7: “Adopt review processes”

I look forward to receiving your final revision and accepting it for publication in Collabra: Psychology.

Please ensure that your revised files adhere to our author guidelines, and that the files are fully copyedited/proofed prior to upload. Please also ensure that all copyright permissions have been obtained. This is the last opportunity for major editing, therefore please fully check your file prior to re-submission.

If you have any questions or difficulties during this process, please contact the editorial office at editorialoffice@collabra.org.

It will make things easier for me if you can submit your revision quite soon. I do not believe these changes will be too effortful.

Katie Corker

**Author Response**

Nov 11

**Katie Corker, Editor**

*Collabra: Psychology*

Thank you for once again reviewing our paper “*Promoting Open Science: A holistic approach to changing behaviour”*.We were very pleased with the latest review and have made the minor changes you have asked for. For example, we’ve thoroughly proofread the document and fixed remaining typos, including those you mentioned in the review. We’ve also checked all of the links throughout the manuscript and replaced some with more suitable links. We’ve also replaced more ephemeral links to Google docs and Youtube videos with stable links. For some links we have also now added a reference to the reference list, inlcuding the video in Table 5 (which now links to documentary’s website). Please don’t hesitate get in touch if any further changes are necessary.

Kind regards,

Sam Robson, Myriam Baum, Jennifer Beaudry, Julia Beitner, Jason Chin, Katarzyna Jasko, Ruben Laukkonen, David Moreau, Rachel Searston, Heleen Slagter, Nik Steffens, Jason Tangen and Amberyn Thomas

**Editor Final Decision: Accept**

Nov 28

Dear Samuel et al.,

I have completed the final review of “Promoting Open Science: A holistic approach to changing behaviour.” I am happy to say that your paper is now officially accepted for publication in Collabra: Psychology. Congratulations on this excellent work. I think it will make an important contribution to the literature, and I look forward to seeing it published! I hope your experiences with Collabra: Psychology have been positive and that you will continue to consider it as an outlet for your work.

As there are no further reviewer revisions to make, you do not have to complete any tasks at this point. Our managing editor will contact you in case there are any pre-prodution file related questions. You will have an opportunity to check the page proofs before we publish your article. Thank you again for publishing in Collabra: Psychology.

Sincerely,
Katie Corker