Questions and Answers (Q&As)

Mind the Gap Webinar – Transparent, Open, and Reproducible Prevention Science

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Q: Where should someone new to open science start?

A: The journal Prevention Science has a special issue "Transparency, Openness, and Reproducibility: Implications for the Field of Prevention Science". The overall goal of this special issue is to facilitate the engagement of prevention science with the open science movement. As part of the special issue, colleagues and I wrote a primer intended to be an introduction on open science for prevention scientists.

Q: How can different types of prevention research incorporate open science practices?

A: In the primer for the Prevention Science special issue, there is a section called "Applying Open Science to Prevention Science" that details how open science practices can be incorporated into epidemiological methods, the development and evaluation of interventions, translational research, community-based participatory research (CBPR), qualitative research, and research using administrative data.

Q: Why is open science important for evidence-based practice?

A: Evidence-based practice is predicated on the ability of empirical studies to reliably identify effective interventions. Detrimental research practices like data mining and selective non-reporting of results can virtually guarantee (spuriously) finding statistically significant or otherwise desired results, threatening the credibility of empirical claims that an intervention is "evidence-based". Open science practices like prospective registration and data sharing can facilitate verification of these claims, engendering trust in evidence-based intervention designations.

Q: How can prevention science tools and methods be leveraged to advance the wider open science movement?

A: Prevention scientists have unique expertise in approaches for identifying, developing, and implementing interventions (e.g., open science reform efforts) that aim to change behaviors (e.g., research practices) and social structures (e.g., the scientific ecosystem). For example, prevention scientists could apply program planning models to rigorously develop, organize, and guide strategic actions intended to improve transparency, openness, and reproducibility. A program planning model can underpin an iterative, continuous quality improvement process that ensures open science efforts are theoretically sound, empirically based, and outcome oriented.

Q: What are potential reservations and challenges for the field of prevention science to address as it transitions to greater transparency, openness, and reproducibility?

A: Challenges to the movement toward a transparent, open, and reproducible prevention science include both warranted concerns and misconceptions. These include inappropriate sharing of sensitive personal information, work-in-progress being scooped, excessive criticism, tensions with legal and intellectual property restrictions, reinforcing inequitable power structures in science, and adding burdensome bureaucracy and regulations. Table 3 in our primer paper promotes discussion about these concerns and how they might be addressed.

Q: Should journals require publication of a statistical analysis plan before publishing the final results article?

A: I like the structure that the Transparency and Openness Promotion (TOP) Guidelines provides for journals to design their own open science policies. It leaves up to each journal (i) which open science practices are relevant to the research that they publish and (ii) how stringent they want their policies for each open science practice to be. As an example in my area of evidence-based practice, I do think moving toward requirements for prospective registration is important for trials that evaluate intervention effects. Journals in my area that are supportive of this transition—but are not yet ready to require registration—have started this transition by requiring authors to disclose whether or not they have registered their trials.

Q: Are there other benefits to open science besides reducing QRPs?

A: Several! Open science helps align scientific practice with scientific ideals, accelerate scientific discovery and progress (e.g., through learning from and re-use of data and materials), and broaden access to and impact of scientific knowledge.

Q: A lot of detrimental practices seem focused around null hypothesis significance testing (i.e., p-values). Would moving away for these methods toward others (such as Bayesian analysis) be helpful?

A: I think that open science practices are equally helpful for Bayesian analysis. Data and code sharing are still needed for computational reproducibility. Protocol and materials sharing are still needed for replication. Prospective study registration and use of reporting guidelines are still needed for comprehensive reporting. The nature of concerns may differ slightly (e.g., specifying priors after results are known or "SPARKing"), though fundamentally I think these practices are just as applicable.

Q: What potential is there for detrimental practices in study design (power analysis, sample size calculation, etc.)?

A: Detrimental research practices are possible at all stages of the research lifecycle, especially when those stages of the lifecycle are "closed" instead of open. Regarding power analysis and sample size calculation, for example, prospective registration helps to ensure that a post hoc sample size calculation (to justify the final sample size) is not presented as a priori. Another example at the design stage is choosing multiple different ways to measure outcomes, not for substantive reasons, but to increase the chances that one finds a desired result.

Q: What research is being done to assess the impact of open science practices? That is, does work incorporating open science perform better on some influence metric (number of citations, h-index, NIH relative citation ratio or RCR, etc.) than work that doesn't?

A: "Meta-science" or "meta-research" has become a particularly active interdisciplinary area over the last decade, with several organizations specifically dedicated to conducting and tracking scholarship in this area. For those new to this space, I recommend starting with resources curated by the Center for Open Science, Berkeley Initiative for Transparency in the Social Sciences, and Meta-Research Innovation Center at Stanford.

Q: Should there be a "grade" for open science practice, such that manuscripts with a higher rating getting precedence/priority?

A: Similar to a previous answer, I like how the TOP Guidelines allow journals to choose what kinds of policies they want to implement, at what level of stringency, for which open science practices they think are relevant. Some policies that speak to prioritizing open science practices are Open Science Badges that explicitly acknowledge things like data sharing, explicit requirements that certain open science practices be used for certain kinds of study designs (e.g., medical journals requiring registration of clinical trials), and submission options like Registered Reports that inherently involve open science practices.

Q: Where do you see the idea of "Technical Performance Studies" (adapted from computational approaches) fitting into prevention science?

A: I think it would be great for prevention scientists to evaluate the performance of new digital tools that they adopt in the spirit of transitioning to open science as the default. This practice could facilitate continuous quality improvement of our computational pipelines and crucial decision points in common types of statistical analyses.