

Methodology and Research Practice

# Responding to the Climate Crisis: The Importance of Virtual Conferencing Post-Pandemic

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The COVID-19 pandemic has brought in-person academic conferences to a halt. A current pressing question among researchers in our field is whether we should return to the pre-pandemic conference model when travel is safe again. We present evidence suggesting that the answer is no. We surveyed 489 researchers studying human behavior and cognition about their pre-pandemic conference attendance, what they value in conferencing, and their attitudes toward solutions for making conferences more sustainable. We found that researchers' average carbon footprints from conference travel are unsustainable in light of recommendations from the Intergovernmental Panel on Climate Change. We also found that researchers are positively inclined towards a variety of changes that would make conferences more sustainable. Given these results, it will be essential for future conference organizers to provide more sustainable and accessible options, including a virtual option for participation at every conference. For attendees to choose virtual formats, it will be important for conference organizers to provide virtual experiences that are as fulfilling as possible, changes which can also be applied to in-person conferencing. We envision a future of conferencing that is more productive, accessible, and environmentally conscious.

The COVID-19 pandemic has forced a massive shift to virtual conferences in 2020, upending the typical ways in which academics interact and share their work. Researchers and academic societies are now asking what conferences will look like in a post-COVID age (Niner et al., 2020) — when people feel safe traveling again, to what extent will we return to the previous, in-person, conference model? This question is linked to a growing awareness among scientists of the negative environmental and social impacts of academic mobility, particularly academic conference travel (Aron et al., 2020; Glover et al., 2017; Nevins, 2014; Rosen, 2017). Toward answering what the future of conferencing should be, we surveyed scientists studying human behavior and cognition about their conference travel and their attitudes toward proposed changes to the standard conference format.

Academic mobility can account for a sizable proportion of a university's carbon footprint (Arsenault et al., 2019). In addition, the pre-COVID conference model, constructed around in-person exchange and mobility, exacerbates disparities in who can access scientific knowledge and community (Niner et al., 2020). Previously, individuals were barred from fully participating in academic networking if they had caregiving responsibilities, health challenges, significant teaching duties, fewer financial resources, or if they lived outside North America and Europe (especially in countries subject to visa restrictions). Despite these issues, social and

institutional structures and interpersonal dynamics within academia have hindered shifts towards better conference models, ranging from expectations of hypermobility, the imperative to cultivate an international reputation, and the value of face-to-face interaction (Caset et al., 2018; Glover et al., 2017; Hopkins et al., 2016; Nursey-Bray et al., 2019).

Much of the prior discussion of these issues has appeared in journals devoted to ecology, geography, and transportation. Scientists working on human behavior and cognition, however, are no less responsible for the environmental harm of their travel, and we believe no less interested in working toward inclusive and equitable scientific exchange. Decisions about the structure of conferences are made within individual academic fields — nonetheless, we are not aware of previous studies that have specifically asked researchers in our field about their conference travel, what they value in conferencing, and what solutions they prefer for making conferences more sustainable. To address this gap, from March through May of 2020 we surveyed 489 scientists across the fields of psychology, neuroscience, and linguistics (among others) about these issues. Respondents were recruited via Twitter and email listservs (e.g., the Cognitive Science Society and Cognitive Development Society listservs).<sup>1</sup> We report the main findings of our survey here; a detailed description of methods and results can be found at: <https://cogscitravel.github.io/survey/>. Participants' ages and career stages spanned a wide range, with 84% between

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<sup>1</sup> A representative recruitment message stated: "our lab ... is conducting a study on sustainability in cognitive science and we are interested in surveying researchers for a study about their habits and preferences for conference formats." We acknowledge that participants who were already concerned about climate change may have been more likely to respond to this survey, and therefore the attitudes we report may not reflect the entire community. We also acknowledge that participants may have inferred that we the researchers believe sustain-

the ages of 25 and 55. Respondents were primarily based in North America (52%) or Europe (32%).

We found that respondents' conference travel from 2019 was environmentally unsustainable. In 2019, respondents attended an average of 2.93 conferences and the median annual distance traveled was 2800 kilometers. Respondents' individual trips took place primarily via plane (54%), car (12%) and train (18%).<sup>2</sup> Our respondents' mean carbon footprint from conference travel in 2019 was 1.06 metric tons<sup>3</sup> per person.<sup>4</sup> The Intergovernmental Panel on Climate Change warned in 2018 that to avoid warming over 1.5°C, global emissions will need to fall 45% from 2010 levels by 2030.<sup>5</sup> Consequently, assuming that global annual per capita emissions (i.e., an individual's carbon footprint from all their activities in a single year) will need to fall to 2.6 metric tons by 2030<sup>6</sup>, an average respondent's three conference trips make up 40% of this per capita emissions goal.

Previous criticisms of in-person conferencing were echoed in a free response question asking participants to "elaborate on [their previous] responses." Across 150 responses, 47% described virtues of the previous format, including the enjoyment of meeting with colleagues, the importance of networking, and the enrichment of global travel. 65% of respondents criticized the previous format, describing a range of burdens: "traveling is exhausting, expensive, and difficult for caretakers" ... "so many hours lost in the actual process of getting from one place to another" ... "conferences continue to proliferate and the resulting impact on climate change increases. We often don't get that much out of them but we are expected to attend." 30% of respondents argued that environmental impacts should be considered when making decisions about conferences, while only 3% argued against this view. Beyond the free response question, survey participants expressed a desire to address negative aspects of in-person conferencing: on average, participants favored enacting policies that would reduce the negative environmental impact of conference travel (mean rating of 76.3 on a scale from 0 to 100). These perspectives, along with the unsustainability of the average researcher's conference travel, point to a clear conclusion: our field should not return to the conference model that was in place pre-COVID.

What types of conference models should we pursue instead? [Figure 1](#) shows respondents' attitudes towards specific solutions that would reduce the negative environmental impact of conference travel. On average (relative to a

baseline of 50 on a scale from 1 to 100), respondents were positively inclined toward collocating small workshops with large conferences (mean = 66.7, 95% CI [64.3, 69.0]), encouraging regional conferences (mean = 61.1, 95% CI [58.6, 63.6]), requiring ground transit for short distances (mean = 60.9, 95% CI [58.0, 63.9]),<sup>7</sup> and requiring carbon offsetting (mean = 60.2, 95% CI [57.5, 62.9]). Attitudes were also positive toward hybrid virtual/in-person conferences (mean = 59.4, 95% CI [56.8, 62.0]), international conferences held at multiple satellite locations (mean = 57.4, 95% CI [55.0, 59.8]), and reducing the number of conferences (mean = 55.4, 95% CI [53.0, 58.6]). Critically, attitudes were neutral or negative toward top-down restrictions such as instituting carbon taxes (mean = 50.1, 95% CI [47.2, 53.0]) or emissions limits (mean = 43.5, 95% CI [40.6, 46.4]). The unpopularity of these restrictions suggests that for conference travel to become environmentally sustainable, researchers must elect to substitute some in-person attendance with virtual attendance, attend conferences closer to home, or take less carbon-intensive modes of transit.<sup>8</sup> In the absence of top-down restrictions on emissions, conference organizers will play a leading role in determining whether conferences become environmentally sustainable — organizers will need to enable and encourage environmentally sustainable choices.

For many conferences and conference attendees, switching to a regional model or using low-carbon-impact modes of travel are not possible. For attendance to become sustainable, conferences will therefore need to continue offering virtual participation or move permanently to a 100% virtual model. The expectation that a researcher must be physically present in a specific location if they wish to present their work is a remnant of a pre-video streaming age, comparable to limiting journal articles to bound paper volumes. For many researchers, sustainable conference attendance will not be possible if the physical presence requirement is reinstated. Allowing virtual attendance would increase scientific access as well as have positive environmental effects, given the various burdens of in-person attendance described by our respondents. The field has also increasingly been archiving conference presentations, which allows researchers across the globe to have immediate access to scientific results.

Despite the benefits of virtual conferences in terms of environmental sustainability and accessibility, it is unclear whether they will become the norm post-COVID. Respon-

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ability is an important topic. Even if our sampling was biased in this way, we do not believe the phrasing of the questions from the survey biased participants toward particular responses.

2 The mode of travel was unspecified for a large proportion of trips (35%) – these trips are excluded from these figures.

3 1 metric ton = 1000 kg = 2205 lbs

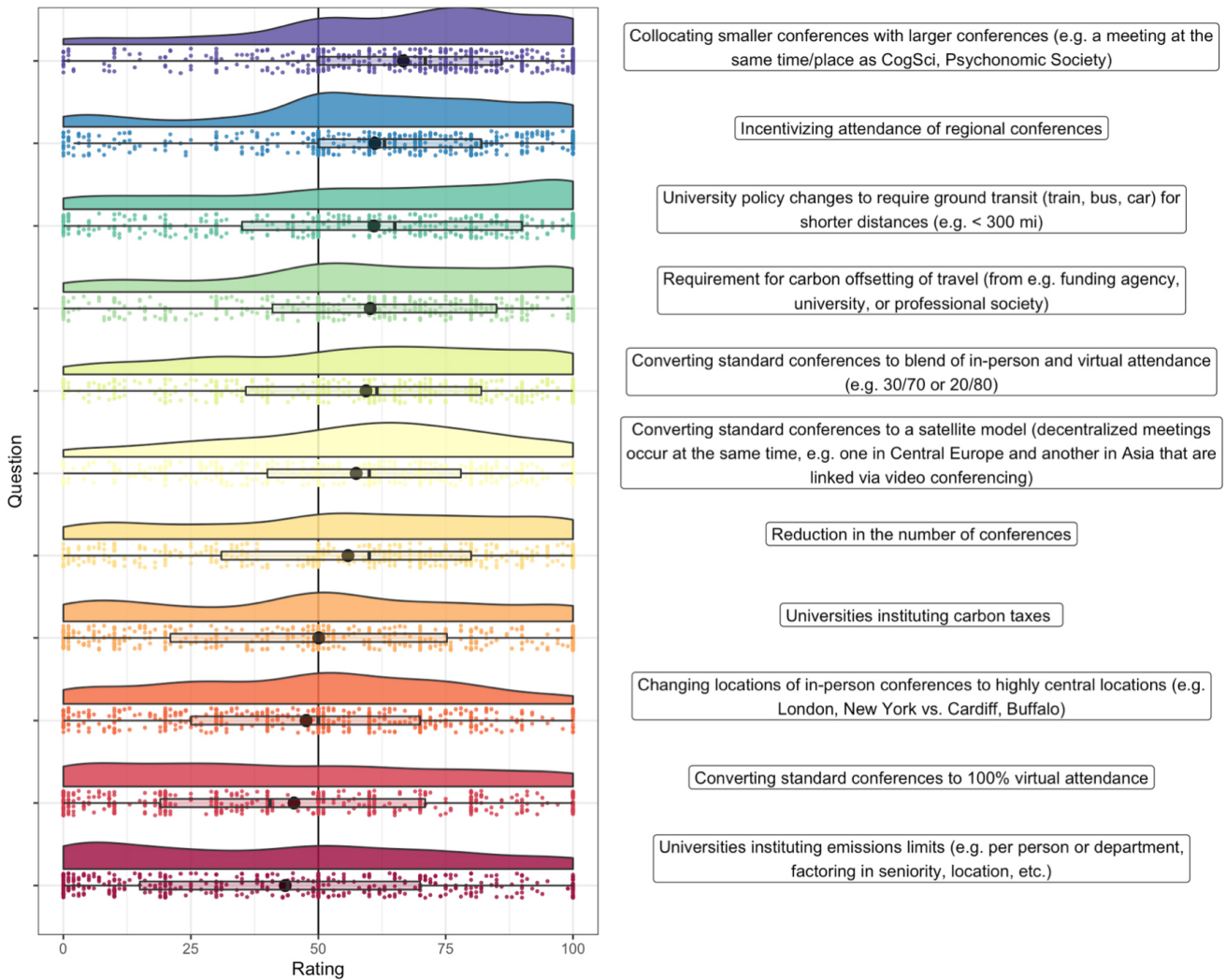
4 We assumed conversion factors of .25, .15 and .04 kilograms of CO<sub>2</sub> per kilometer for airplane, car and train, respectively, based on <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019>. Fuel efficiency estimates are based on average- or best-case scenarios. The 0.25kg/km CO<sub>2</sub> conversion assumes a specific altitude to maximize efficiency for economy passengers and estimates the negative effects of airplanes emitting CO<sub>2</sub> higher in the atmosphere. We also assumed a conservative estimate of .15 kg CO<sub>2</sub> per kilometer for 447 conference trips in which respondents did not specify a travel modality. These trips are likely to be plane trips based on the distances traveled (1736 km on average).

5 <https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/>

6 <https://data.worldbank.org/indicator/EN.ATM.CO2E.PC>. In 2010, the average per capita emissions across the globe was 4.8 metric tons.

7 Respondents from Europe were particularly supportive of requiring ground transit for short distances with a mean rating of 75.8, which may reflect the accessibility of train travel in Europe.

8 Carbon offsets may play a positive role but are likely only a partial solution (Aron et al., 2020).



**Figure 1: Attitudes toward different climate and accessibility solutions. Black bars show median ratings; dots show mean ratings. Solutions are ordered by mean rating, from most popular (collocating small workshops with large conferences) to least popular (setting emissions limits).**

dents to our survey rated hybrid in-person/virtual conferences (mean=59.4) and conferences with multiple virtually-linked satellites (mean=57.4) significantly higher than purely virtual conferences (mean=45.2; 95% CIs over the differences: [12.4, 17.6] and [9.7, 15.3], respectively). This preference may change as researchers gain more experience with virtual conferences, but it is likely that researchers, like most people in general, will crave in-person interaction once travel feels safe again. For researchers to choose virtual attendance even when in-person attendance is possible, it is imperative that virtual attendance be enriching and rewarding.

Conferences are currently experimenting with new structures for engaging online, including facilitated breakout discussions, text-based messaging channels centered around specific sessions, and “flipped” structures, where attendees view online talks asynchronously prior to a synchronous discussion. Large conferences with multiple satellite locations could offer a powerful synergy of international connection and in-person interaction. Conversations about improving the virtual conference experience are occurring in multiple academic fields (Jordan & Palmer, 2020; Klöwer et al., 2020), as the problem of unsustainable conference travel is shared across fields. The broad scientific communi-

ty needs a central forum where organizers can share ideas, successes, and areas for improvement.

If the structures created to enhance a virtual experience are beneficial, they should be implemented even for in-person conferences. Our survey showed that in-person presence at a conference comes at a cost – in some cases, researchers have made real sacrifices to be able to attend. In-person conferences should therefore prioritize facilitating the face-to-face interactions that are so hard to replicate virtually. Conferences in which the primary in-person activity is passive content consumption are not offering the full benefits that in-person interaction affords. If in-person conferences are re-oriented around interaction, we expect that they will be more enriching and productive, better justifying their cost and enabling researchers to attend conferences in person more selectively.

2020 has upended the status quo and brought new calls for change. Our field should respond to this moment by shedding old structures to make way for innovative and sustainable modes of gathering. These innovations are essential for the scientific integrity of our field and would exemplify the kind of collective action that is necessary to avoid the worst consequences of climate change.

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We have no conflicts of interest to disclose.

## Contributions

Substantial contributions to conception and design: LR, CLJ

Acquisition of data: LR, CLJ

Analysis and interpretation of data: LR, CLJ

Drafting the article or revising it critically for important intellectual content: LR, CLJ

Final approval of the version to be published: LR, CLJ

## Data accessibility statement

All data and analysis scripts are available at (<https://github.com/cogscitravel/data>).

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## SUPPLEMENTARY MATERIALS

### Peer Review Comments

Download: [https://collabra.scholasticahq.com/article/17966-responding-to-the-climate-crisis-the-importance-of-virtual-conferencing-post-pandemic/attachment/46823.docx?auth\\_token=tBsCuxOC-l83K1kTLG3l](https://collabra.scholasticahq.com/article/17966-responding-to-the-climate-crisis-the-importance-of-virtual-conferencing-post-pandemic/attachment/46823.docx?auth_token=tBsCuxOC-l83K1kTLG3l)

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