SAGE researchmethods cases

Benefits and Challenges in Pivoting to Online When Studying the Cognitive Aging of Memory

Contributors: Yashoda Gopi, Ruo-Chong Zhang & Christopher R Madan
Pub. Date: 2022
Product: SAGE Research Methods: Doing Research Online
Methods: Online surveys, Recruiting participants, Data collection
Disciplines: Psychology
Access Date: March 17, 2022
Academic Level: Advanced Undergraduate
Publishing Company: SAGE Publications, Ltd.
City: London
Online ISBN: 9781529799842
DOI: https://dx.doi.org/10.4135/9781529799842
© 2022 SAGE Publications, Ltd. All Rights Reserved.
This PDF has been generated from SAGE Research Methods Cases.

Abstract

This case study discusses challenges and advantages associated with pivoting from lab-based to online research. We outline three experimental studies related to memory and cognitive aging that were shifted online due to the pandemic. Across these projects, we experienced difficulties in experiment implementation, participant recruitment, procedure compliance, and conference presentations. However, we also found noteworthy advantages to conducting experiments online across these four aspects of the research process. Based on our experiences, we outline solutions we used to remedy the problems we encountered and suggest essential considerations for researchers moving their research from the lab to online.

Learning Outcomes

By the end of this case, students should be able to:

- Evaluate the challenges and limitations in implementing an online experiment in comparison to a lab-based experiment
- Justify the advantages of online recruitment and essential considerations when selecting and using online recruitment platforms
- Contrast different scheduling requirements for lab-based and online recruitment while implementing procedures for engagement monitoring
- Critique the opportunities associated with online, hybrid, and in-person conferences

Project Overview and Context

This case study outlines three research projects that examined cognitive aging and memory which were impacted by changes to the research process when moving from lab-based to online research. Previous research has established that age-related changes in brain structure and function correlate with age-related changes in cognition. Within the scope of normal cognitive aging, there are declines in cognitive functions such as attention, language, and memory (Harada et al., 2013). Memory complaints are common among older adults, and memory deficits can negatively affect participation in activities of daily living (Rotenberg et al., 2019). While semantic memory—memory for general knowledge such as world facts and word meanings—generally remains intact over time, deficits in remembering recently learned information (e.g., names or words) and working memory (ability to temporarily hold and manipulate information) are associated with increasing age. It is therefore essential to examine the extent to which memory is impacted during cognitive aging and explore options to reduce the negative consequences of memory deficits. The three outlined projects were designed to address these topics.

The first project examined a strategy to reduce memory failures in everyday life when trying to remember people's names; the second project explored the impact of the type of memory task on how adults across all ages learn and remember. The third project examined the effect of emotion on the learning of associations between images. These projects were initially conceptualized with the expectation of recruiting adults to perform experiments in a lab. However, because of the pandemic, they were adapted to be conducted online. During this process, we found several noteworthy challenges and advantages in the experiment implementation, data collection, and dissemination stages of research that were common across the three outlined projects.

Section Summary

- This case study covers three research projects concerning cognitive aging and memory.
- The three outlined projects were adapted to online research during the pandemic, and the associated challenges and learning opportunities will be highlighted in this case study.

Research Design

These research projects explored the influence of specific factors on memory across adults of all ages using similar methodologies: the first examined how memory strategies can influence name recall; the second examined the impact of task switching and speed of processing on word recall, and the third explored influences of emotion on associated images. During the shift from lab-based to online research, we experienced similar challenges across these projects, but we also encountered unique experiences that led to different considerations and solutions for each project. Moreover, we found benefits such as learning opportunities and skill development as researchers. Highlighting our individual and collective experiences and solutions can provide comprehensive considerations for other researchers attempting to conduct similar online studies.

The first study examined the effectiveness of a mnemonic strategy to improve the learning of face-name associations. Mnemonic strategies are techniques used to mentally manipulate to-be-remembered information to improve recall at a later time (Scruggs et al., 2010). Here we examined name recall using a face-name mnemonic. Instead of recruiting participants locally from the community as initially planned, we used an online platform—Prolific. During the experiment, participants saw images of faces and names below them on their computer screen and were instructed to remember these face-name associations. Half of the participants were instructed to remember the face-name associations using a described mnemonic strategy. The strategy involved two steps: imagining the name transformed into an object, for example, the name “Gordon” transformed into the word “garden,” and then imagining the person in the image interacting with that object, for example, Gordon is in a garden. The other half of the participants were instructed to simply remember the face-name pairs to the best of their ability. Afterward, participants saw each face again and had to type in the name. Participants completed two sessions of viewing the face-name pairs and recalling the names and then answered some questionnaires about their memory and experiences during the task in an online survey platform–Qualtrics. The study was designed to be completed within 45 minutes.

The second study examined the impact of task load on memory. Task load is a multilevel construct representing the "load" imposed on learners' cognitive systems during a task. Older adults have diminished engagement in learning and memory tasks compared to younger adults due to reduced working memory capacity and difficulty ignoring irrelevant information (van Gerven et al., 2000). Therefore, it is important to understand how task load can be manipulated to facilitate learning and memory in this population. Here we manipulated task load through task difficulty. In the experiment, participants viewed short lists of intentionally to-be-remembered words, which were interleaved with a secondary judgment task. In the secondary task, participants viewed and responded to an alternating sequence of numbers and letters. When a number was presented, participants were instructed to press a specified key on the keyboard to indicate whether the number was odd or even; when a letter was presented, participants compared it to the letter presented two times prior, that is, a 1-back task, and pressed a key to indicate whether the same letter had been shown again. To manipulate task load, we varied the presentation pace of the interleaving task to create two levels—*slow* presentation for *low* load, which allowed adequate time for participants to respond, whereas *fast* presentation required *high* load, as participants had less time to respond. All participants completed both task load conditions and recalled the words they saw at the end of each condition. The task was designed to take 30 minutes to complete.

The third study examined how forming associations with emotional images might change pleasantness ratings of the associated information. Prior studies have demonstrated that negative emotional images are remembered better than emotionally neutral images; however, they also lead to worse memory for associations (Madan et al., 2012). Here we are interested in if there would also be changes in pleasantness ratings due to this association learning. We asked participants to "Remember that these images go together," where the left image was either a negative or neutral scene and the right image was always a neutral object. After an initial study phase, participants were presented with each scene again and were asked to choose the associated object from five options, all of which had been shown in the study phase, as a test of associative memory. In the last phase, participants were shown each of the objects and asked to make a pleasantness rating on a six-point scale. Participants were undergraduate students, and the task was designed to be completed within an hour.

Section Summary

- The first project examined the effectiveness of a mnemonic strategy on name recall.
- The second project examined the impact of task difficulty on memory.
- The third project examined the effects of emotion on associated pictures.

Research Practicalities

All three projects began being planned as in-person research studies but had to shift to being conducted online. Therefore, several necessary changes were made to the design, implementation, and dissemination of the research. We will discuss the challenges and advantages of the online research process involving experiment implementation, participant recruitment, procedure compliance, and conference presentations.

2022 SAGE Publications, Ltd. All Rights Reserved.

Experiment Implementation

To run an experimental research study, it first needs to be programmed to display information to participants at precise times and record responses from participants. When conducting research in the lab, we programmed experiments using PsychoPy, a software package developed for building behavioral experiments (Peirce et al., 2019). This involved using a "builder" where we selected certain features of the experiment to be displayed on the screen such as images and text. There was also a "coder" where we used the Python programming language to input additional aspects that were not available or more complex than the builder interface allowed. When redesigning our experiments to run online, we encountered several challenges including (1) managing different programming languages and software, (2) browser compatibility, and (3) limited control over experiment implementation. On the other hand, we also experienced advantages including learning a new programming language and related skill development as a researcher.

For online research, experiments need to be made available to participants on their own computers at home while maintaining the structure and stimuli as with in-person experiments. In our studies, we changed from programming the experiments using Python to using JavaScript, which can run in an internet browser. Several options are available for making such alterations including the translation feature of PsychoPy, which automatically changes some Python code to JavaScript, and dedicated online experiment builders such as Gorilla, PsychoJS, or lab.js. We used two of these approaches for the outlined projects. For the face-name association study, we used the lab.js builder and coder; for the task load and emotional image studies, we used the semi-automated PsychoPy translation feature for PsychoJS conversion. In the first study, we determined that a "start from scratch" approach would best allow us to incorporate both image (faces) and text (names) stimuli that were displayed together during the task. It was also important for participants to view their responses as they typed them on the screen. The challenge here was in changing the programming language from Python to JavaScript. For example, while there was a "textbox" component of the PsychoPy builder where names could be typed in and displayed on the screen, this was not as readily available in lab.js. To solve this issue, we used an HTML form where the names were typed in and submitted as a form response for each face, but this required additional JavaScript code to present the images in the correct position while allowing text responses to be typed and viewed on screen. In the second and third studies, the semi-automated translation feature for PsychoJS provided a sufficient starting base that we then built upon to produce the final experiment code. However, the challenge was insufficient translations, and thus, we needed to manually rewrite complex aspects of the code from Python to JavaScript. Across these cases, it was vital for us to revert to an initial learning stage to produce the correct code by following the introductory documentation and examples provided by the respective software used. This required additional time commitments that resulted in prolonged overall study completion times.

The second challenge of experiment implementation came during data collection, where we found that some internet browsers, such as Safari, were incompatible with the programmed experiment. Unfortunately, this issue was not captured during experiment development as we did not typically use this browser. Since Safari is not as frequently used as other browsers, we decided to include a disclaimer at the beginning of the task recommending the use of the most compatible browser, Google Chrome. This also highlights the third challenge we experienced, limited control over experiment implementation. During in-person research, an experiment can be tested on the computer that will be used for data collection, reducing the chances of technical errors. However, when collecting data online, computer configuration, screen sizes, and availability of a keyboard number pad are outside the experimenter's control. Moreover, in a lab, it is possible to oversee experiment implementation and thus prevent or quickly diagnose and troubleshoot issues such as participants accidentally exiting the experiment or experiment crashes. However, this control was diminished with our online data collection as participants may have encountered errors in the task but not reported them or simply attempted to restart the experiment. To address these issues, we asked participants to report any issues at the end of the experiment.

While solving the outlined challenges to experiment implementation, we found it beneficial to learn new skills in the form of JavaScript programming, HTML, and CSS that can be applicable in different situations. For example, taking the time to learn the basics through tutorials and practice with examples and instructional videos resulted in improved knowledge of Python, JavaScript, and HTML. We were also able to improve our code to capture the essential aspects of the experiment and allow the experiments to run smoothly without experimenter oversight during data collection. While the second and third challenges had different approaches to the resolutions, we developed essential skills including problem-solving in a time-limited context, for example, implementing a solution before more participants encounter the same error. We also learned to adapt to new challenges such as including disclaimers or questionnaires where necessary. Finally, we learned critical time management skills, that is, scheduling enough time to learn a new programming language while maintaining research progress. In sum, we faced several challenges during our experiment implementation when shifting to online research, including managing different software and browser compatibility while maintaining control over the experiment during data collection. However, finding solutions to these difficulties led to vital learning opportunities and skill development as researchers.

Participant Recruitment

Participant recruitment for in-person studies can include convenience sampling, flyer advertising, and local online platforms. Recruitment involves scheduling, ensuring potential participants meet the inclusion and exclusion criteria, preventing repeated participation in the same study, and ensuring ethical guidelines are followed to protect anonymity during the research process. When moving to online data collection, some of these considerations remained in place, but we also needed to make some adaptations for our experiments. The challenges we experienced included screening eligibility and participant engagement. However, advantages to recruiting online rather than in-person included (1) rapid data collection, (2) large sample availability and diversity, and (3) reduced scheduling requirements.

Online platforms available for recruiting participants include the psychology research participant pool that many universities have, where undergraduates participate in experiments to receive credits, and recruitment websites where individuals can participate and receive monetary payment (Palan & Schitter, 2018; Sauter et al., 2020). In two of our studies, we used Prolific to recruit participants and initially found it challenging

2022 SAGE Publications, Ltd. All Rights Reserved.

to manage screening eligibility. Briefly, Prolific (https://prolific.co) is an online platform for recruiting research participants when conducting behavioral, user, or market research. We prescreened potential participants using Prolific filters with demographic (e.g., age), geographic (e.g., current country of residence), and language fluency (e.g., English as a first or fluent language) criteria. However, these filters are based on self-reports from participants and can be falsified to maximize study participation opportunities. To reduce this possibility, we included questions *within the experiment* that matched the phrasing of the Prolific filter questions to verify consistency. When doing so, we found some discrepancies between the Prolific demographic output data and the responses in our questionnaires, leading us to question whether we were recruiting our intended sample. To resolve this issue, we contacted participants via the Prolific messaging system to confirm the correct information, but this required increased time and effort because the responses sometimes meant that their participation was invalid, and thus the slot had to be reopened.

Another challenge of online recruitment is that some participants engage with research studies as a form of work with the intention to maximize monetary compensation and thus regularly participate in multiple research studies throughout the day. This may not only result in fatigue but also in non-naivety, where participants are familiar with research methodology and maybe “vulnerable to demand characteristics by providing untrue responses based on their perceptions of researchers’ expectations” (Newman et al., 2021, p. 1385). In our previous experiments, we found participants trying to maximize monetary compensation by randomly clicking answers or providing incoherent responses, as this would allow them to complete the study and get paid more quickly. To address this, we subsequently included attention checks and open-ended questions to filter out unengaged participants. Moreover, dedicated research platforms such as Prolific attempt to prevent these instances and provide information about participant engagement. This information can be used to identify “super workers,” for example, if their number of completed or rejected studies is unusually high in comparison to the other participants. This was an important consideration for us when deciding where to recruit participants for our studies—though the cost is higher when using such platforms, as opposed to distributing the link to a study through social media, these mechanisms in place can improve data quality.

Across our research projects, we also experienced considerable benefits of using online recruitment platforms. First, data collection was completed within 2 weeks with multiple recruitment postings in a day, whereas in-person data collection for a prior study required months of booking shared lab space. Moreover, the sample availability was much larger and more diverse compared to in-person recruitment, which mostly included university students. This was particularly beneficial for our aging research, as recruiting older adults in person would require travel to participate, limiting engagement. In addition, with a more diverse sample of online participants, study findings can be more generalizable to wider populations. Finally, we experienced a substantial reduction in scheduling requirements; where our prior in-person studies required multiple emails, booking the lab space, and a limited timeframe based on researcher availability, online recruitment allowed for improved scheduling as we were able to publish our studies and allow participants to participate at their convenience. In sum, screening eligibility was relatively challenging compared to in-person recruitment for our projects, but we determined that selecting a recruitment platform that provides reliable participants is crucial. Moreover, online recruitment has considerable benefits, including faster data collection, a wider sample, and

2022 SAGE Publications, Ltd. All Rights Reserved.

reduced scheduling requirements.

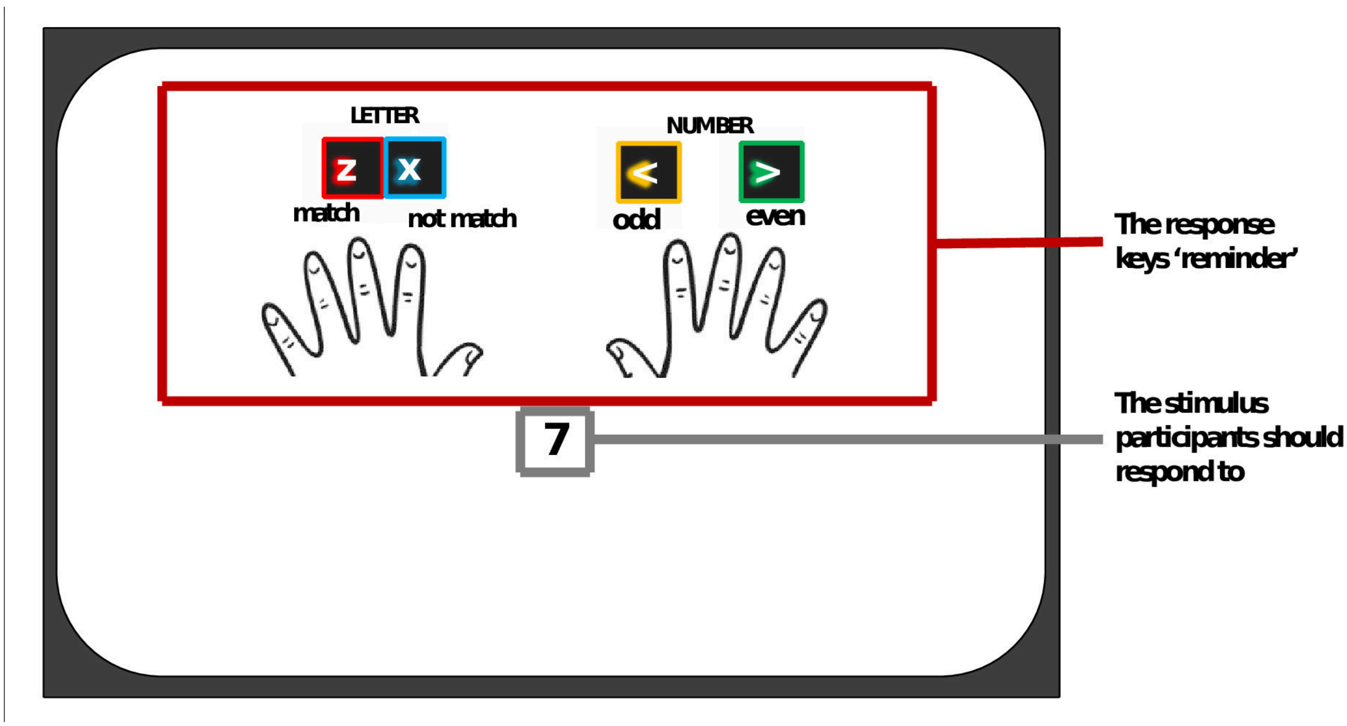
Procedure Compliance

In-person testing does not typically require the experimenter to include “attention checks,” as participants normally have minimal distractions in the lab and can ask for further clarification if necessary. The experimenter’s presence in the room can facilitate procedural compliance, and instructions can be given through a combination of verbal communication, body language, and demonstrations. However, online testing does not allow for this ready interaction with the experimenter, thus requiring additional steps to ensure instruction comprehension and adherence. In our studies, we found it challenging to have limited opportunities to provide instructions and improve participants’ comprehension where needed or prevent the use of external memory aids such as notepads during the memory tasks. Nevertheless, with careful consideration, appropriate checks were implemented remotely, significantly saving us time and resources.

Our first challenge with procedural compliance was whether online participants had sufficient and accurate comprehension of instructions without interacting with the experimenter. This was important because our experiments involved multiple steps of stimuli exposure and responses. For example, our face-name association study required participants to understand and apply the strategy, while the task load study required participants to make multiple types of responses during the task while remembering the word lists. The issue of procedure compliance in online tasks is commonly addressed with attention-check questions or additional instructions throughout the task (Gummer et al., 2021; Shamon & Berning, 2020). These may include questions that are phrased in an irregular way, likely out of context with the rest of the survey or task. An example of an attention-check question in a survey assessing memory strategies used in daily life, participants could be asked: “Have you ever had a fatal heart attack while watching TV?” However, we were particularly concerned that asking participants in a memory study if they have understood and followed the instructions may not necessarily elicit honest responses—unlike survey questionnaires which may not have a “correct,” but only the “best” answer, our task load task was characterized by a dichotomous, “right-or-wrong” response. Thus, participants who consider their performance as an aptitude index may be motivated to achieve correct responses. Conversely, due to being unmonitored, those who only participate to get monetary rewards may haste through the instructions without full comprehension, especially when the instructions are complex. To improve instruction comprehension, we included a practice task at the beginning of our experiments; yet, this prolonged the tasks and could not guarantee comprehension or adherence to instructions throughout the experiment. To check instruction comprehension, we asked participants questions about the instructions they were given before the task. Multiple incorrect responses indicated that participants did not understand or were not engaged. However, even if participants answered these questions correctly, conceptual understanding does not necessarily translate to the acquisition of the psychomotor responses, especially when participants were asked to respond with predefined keys, as with our task load study.

When testing in person, participants learned the instructions from our demonstration, completed several practice trials under monitoring, and received real-time feedback from us if they made an incorrect response. For the task load study, we also placed stickers on the keyboard to indicate the mapped response keys, providing tactile feedback to facilitate rapid psychomotor learning. In contrast, during online testing, participants may read the instructions, learn to associate pressing the left or right arrow key in response to an odd or even number, yet still need additional practice. To address this issue, we added a visual instruction to remind participants of the response keys throughout the task (Figure 1), but this resulted in limited control over the actual mapping of participants' own keyboards. For example, the mapping would differ if participants had a full keyboard with the number keypad or a laptop keyboard (without a number keypad). Without tailoring to individual devices, a standardized instruction page can be misleading, and some participants also found the reminder instruction distracting. These issues raise questions about the benefits of having additional instructions on the same screen as the task. Additionally, having both instructions check questions and practice trials can be time-consuming and without fully understanding the instructions, participants may still score above chance level in a choice reaction time task like ours. This further complicates data analysis, where we must decide on the performance criteria for participant exclusion. Therefore, having questions and practice trials prior to commencing the experiment proper like online survey questionnaires may not reliably prevent instruction misconception in memory studies with behavioral tasks.

Figure 1. A schematic of a trial stimulus and response key reminder.



Note. The two hands and mapped response keys (red box) is the reminder, shown on top of the screen. The number "7" (gray box) is the stimulus participants respond to. In this example, the correct response key is the left arrow key, corresponding to the right index finger. These images are not scaled to size to improve visibility.

This leads to the second challenge we encountered with procedural compliance: in memory studies, participants' motivation to achieve high performance, the absence of an experimenter, and the lack of real-time feedback may have driven incompliance. Specifically, our concern is participants' use of external aids to help them remember. Across our studies, there was a memory component that required participants to learn and recall information, making the tasks especially challenging. Without the presence of the experimenter engendering a sense of being monitored, online participants may use unwanted external aids for memory offloading, such as writing down to-be-remembered information or cues on a notepad. Here, having an additional instruction asking participants to *not* use external aids creates a dilemma: first, the extent to which participants follow this instruction cannot be verified. For instance, if a recall ceiling effect is observed, we cannot differentiate genuine recall from participants who have exceptional memory and those who use external aids. Second, the additional instruction may inadvertently cue participants who did not previously consider using external aids to do so. Specifically, participants who consider their performance as an aptitude index, being performance-driven, or incentivized by the monetary compensation may be more mindful about their data quality, therefore inclined to use these methods. Hence, the validity and reliability of using additional instructions to improve procedural compliance remain questionable. One potential solution to this issue is to ask participants at the end of the experiment whether they used any aid to improve their memory during the task while emphasizing that they would retain their compensation to encourage truthful responses. In summary, challenges to online procedure compliance include limited oversight by the researcher to improve instruction comprehension and prevent the use of external memory aids, but these challenges can be subverted by implementing checks that are carried out remotely, greatly reducing time constraints for the researcher.

Conference Presentations

Attending and presenting at academic conferences is an integral aspect of being a researcher and an essential skill to be developed, especially for junior researchers. For many years, conferences have discussed shifting to online to improve inclusivity and decrease contributions to climate change (Aron et al., 2020; Gichora et al., 2010). As research is increasingly adjusting to be online, the numbers of virtual or hybrid conferences have also been soaring since last year. While this has created unprecedented opportunities and encouraged equality, diversity, and inclusivity on a large scale, we highlight several challenges we experienced, including (1) reduced professional networking opportunities, (2) limited audience–presenter interaction and learning from feedback, and (3) conference platform-dependent user experiences. These challenges underline the need for academics and conference organizers to leverage the benefits of virtual and hybrid conferences while generating creative solutions for the betterment of future conferences.

On the macro level, virtual conferences can save the rigmarole of traveling across country borders or time zones, encouraging the participation of disadvantaged researchers. The reduced amount of travel can also significantly decrease carbon emissions and help fight against climate change (van Ewijk & Hoekman, 2021). However, compared to in-person conferences, there are fewer networking opportunities through casual interactions, for example, "water cooler" conversations. Although virtual conferences often dedicate time slots or virtual chat rooms for networking, these discussions lack spontaneity compared to in-person encounters, especially given the transparency of attendees' names. In contemporary Western culture, employees who

2022 SAGE Publications, Ltd. All Rights Reserved.

spend more time in the office are generally perceived as more committed to their jobs regardless of actual productivity levels (Nakrošienė et al., 2019). Similarly, in hybrid conferences, in-person attendees may be seen more favorably compared to virtual attendees and are exposed to more networking opportunities during conference break times.

On the microlevel, attending virtual conferences may require researchers to prerecord their presentations. This practice is beneficial for (1) creating digital archives that facilitate open access and open science practices, (2) freeing attendees from "fear-of-missing-out" as they can view talks that they might have otherwise missed due to scheduling conflicts, and (3) permitting errorless learning for inexperienced presenters, as they can use notes to refine their presentation without being exposed to a large audience. However, these practices also limit engagement and reciprocal interactions between researchers and audiences. For instance, a principal investigator may simply prerecord the presentation and delegate the question-and-answer sessions to a junior lab member during the conference. Furthermore, virtual conference platforms such as Zoom and Teams allow the audience to switch off their cameras and microphones. During presentations of the outlined projects, this limited our opportunities as presenters to receive real-time feedback through body language cues and adjust our presentations accordingly, creating an "errorless, but no learning" scenario.

During a virtual poster presentation in the Gather.town platform, we experienced the faux pas of immediately asking if an attendee wanted to hear about our study, while they were still listening to the prerecorded video. These situations occurred due to the lack of social cues we normally experience in face-to-face communications. Finally, in virtual or hybrid conferences, the experience largely depends on the platform user interface and internet stability. While some platforms provide easy-to-navigate interfaces, others focus on embedding excessive functions and links which can be confusing and overwhelming. We have also experienced website crashes due to high traffic or disruption of the prerecorded video due to compatibility issues. Taken together, virtual or hybrid conferences improve general inclusivity, but those who do not have a stable internet connection and, thus, access to the required conference software may be at a disadvantage in virtual or hybrid conferences—an important issue that should be considered by academics and conference organizers. One option would be to allow text comments to be left at the presentation by conference attendees, allowing for the presenter to later leave a response comment as well. This asynchronous communication can allow for presenters to get more feedback from attendees that may have otherwise been unable to view the work at the scheduled time due to other responsibilities or time-zone differences.

Section Summary

- Programming an online experiment required managing different software and programming languages, browser compatibility, and experiment control. Solving these challenges presented critical learning and skill development opportunities.
- Online recruitment and data quality can be challenged by participants' motivation for participation. After screening tools and check questions were implemented to verify demographic data

consistency, online recruitment had clear advantages—including rapid data collection, diverse samples, and reduced scheduling requirements.
- Challenges to online procedure compliance included limited oversight by the researchers and preventing the use of unintended external memory aids. However, it is possible to maximize procedure compliance by implementing attention and comprehension checks, as well as performance data quality checks.
- The rise of virtual or hybrid conferences has greatly improved inclusive participation. However, these types of conferences may also result in reduced networking opportunities and presenter–audience interactions.

Practical Lessons Learned

- *Take the time to learn.* To move our research projects from in-person to online, we needed to change our experiment programs from Python to JavaScript. While initially relying on the automatic translation feature for its convenience, we soon realized its insufficiency, causing us to revert to the beginning phase of programming language learning. Our first takeaway from this experience is that the best approach is to take a step back and learn the basics. The second takeaway is the importance of testing the experiment on multiple browsers and operating systems to check compatibility. Finally, we found that although control over the actual experiment implementation is limited, it is possible to capture relevant experiment information such as screen size, operating system, browser, and whether participants encountered any issues during the experiment which can then be examined to improve consistency during online testing.
- *Online recruitment can provide quick data but is it reliable?* While online recruitment is appealing because of rapid data collection, it is important to consider unspoken aspects of data quality. Although online platforms may have prescreening options which can improve sample quality, these are often self-reported and should be cross-checked within the experiment. It is also necessary to consider the type of recruitment platform and if participants engage with the platform as a major source of income as this may influence the data quality. Finally, online data collection can be instantaneous, saving tremendous time from haphazard scheduling, sharing a limited lab space, and allowing participants to participate at their own time of convenience. We acknowledge these myriad benefits, and as more data are collected online, we expect better methods to improve data quality.
- *Approach the task and instructions from the participants' perspective*. Despite the emerging use of online testing for behavioral tasks, we faced extra challenges in our memory and aging studies. First, participants' comprehension of instructions should be evaluated when the task involves complex response contingencies. Although it is possible to check instruction comprehension by asking questions about the instructions, correct answers may not equate to real comprehension or adherence. Online testing for learning and memory experiments can be further complicated by whether performance is truthful and reflects participants' real memory capacity, that is, without the use of unintended external memory aids. As experimenters, it is important to approach the task

and instructions from participants' perspective, being clear, yet simplifying task instructions, and implementing checks before, within, or after the task to encourage procedural compliance.

- *Focus on learning when attending virtual/hybrid conferences*. While presenting the outlined projects at hybrid conferences, we not only benefitted from fewer travel requirements and the convenience of prerecording our presentations but also experienced the challenge of presenting to an audience with limited social cues. Additionally, we have remaining queries on professional networking opportunities because of the "unnatural" flow of virtual or hybrid conferences and inclusivity being dependent on internet or platform accessibility. Altogether, virtual and hybrid conferences can be beneficial if we focus on the available learning opportunities.

Section Summary

- When designing an online experiment, it is important to take time to learn the new software, test the experiment thoroughly, and identify components that can vary across devices.
- Online recruitment is appealing due to rapid data collection, but it is essential to evaluate the available platforms and confirm prescreened measures by embedding questions in the experiment.
- It is important to consider participant perspectives when designing an online task and check comprehension and adherence to the instructions as the experimenter is not readily available as in the lab to provide support.
- Virtual and hybrid conferences immensely improve inclusivity, but it is equally important to actively seek out networking opportunities and audience feedback to adapt to the virtual presentation format.

Conclusion

When moving from in-person to online research during our studies, we found several challenges in the experiment implementation, participant recruitment, procedure compliance, and conference presentations. We approached these challenges by taking the time to learn a new programming language to efficiently code an online experiment, carefully designing questionnaires to screen participants, implementing comprehension checks to make sure our instructions were being understood, and using the tools provided by conferences to improve our opportunities to disseminate our research. These challenges served as an important feature of our shift from in-person to online research as they have led us to be adaptive to the changing aspects of research and required us to critically assess our research methods.

We also experienced notable advantages to conducting research online as opposed to in-person. These included the opportunity to develop new programming skills as a researcher that will aid in preparation for future opportunities, rapid data collection through online platforms that provide features to improve data quality, the ability to implement procedure compliance checks remotely to reduce time commitments, and the opportunity to attend more inclusive conferences to disseminate our research to the wider community. We suggest that researchers who are embarking on a similar approach of shifting to online research consider the challenges and benefits in experiment implementation, data collection, and dissemination aspects of research

2022 SAGE Publications, Ltd. All Rights Reserved.

outlined here.

Classroom Discussion Questions

1. What are some considerations that are unique to designing an experiment that will be run online?
2. What are some differences between recruiting participants online versus in-person?
3. For an experiment related to a different domain of cognitive psychology, what are some additional measures that might be necessary for ensuring that online participants comply with task instructions?
4. Some conferences have organized international multisite events, where groups meet in their local city with presentations live-streamed to all sites around the world. How do you think this model will be used in the coming years, as an alternative to in-person or hybrid conferences?
5. How does the relatively new possibility of online presentations change our ability as researchers to engage in science outreach with the broader community?

Further Reading

Bridges, D., **Pitiot, A.**, **MacAskill, M. R.**, & **Peirce, J. W.** (2020). The timing mega-study: Comparing a range of experiment generators, both lab-based and online. *PeerJ*, 8, e9414. 10.7717/peerj.9414

Murman, D. L. (2015). The impact of age on cognition. *Seminars in Hearing*, 36(3), 111–121. 10.1055/s-0035-1555115

Paas, F., **Tuovinen, J. E.**, **Tabbers, H.**, & **Van Gerven, P. W. M.** (2003). Cognitive load measurement as a means to advance cognitive load theory. *Educational Psychologist*, 38(1), 63–71. 10.1207/S15326985EP3801_8

Schryer, E., & **Ross, M.** (2013). The use and benefits of external memory aids in older and younger adults. *Applied Cognitive Psychology*, 27(5), 663–671. 10.1002/acp.2946

Web Resources

https://study.sagepub.com/psychology/resources/peirce-macaskill-building-experiments-in-psychopy

https://researcher-help.prolific.co/hc/en-gb/articles/360009223553-Using-attention-checks-as-a-measure-of-data-quality

https://www.pewresearch.org/methods/2020/02/18/two-common-checks-fail-to-catch-most-bogus-cases/

https://www.cloudresearch.com/resources/guides/ultimate-guide-to-survey-data-quality/how-to-identify-handle-invalid-survey-responses/

2022 SAGE Publications, Ltd. All Rights Reserved.

References

Aron, A. R., **Ivry, R. B.**, **Jeffery, K. J.**, **Poldrack, R. A.**, **Schmidt, R.**, **Summerfield, C.**, & **Urai, A. E.** (2020). How can neuroscientists respond to the climate emergency?*Neuron*, 106(1), 17–20. 10.1016/j.neuron.2020.02.019

Gichora, N. N., **Fatumo, S. A.**, **Ngara, M.**, **Chelbat, N.**, **Ramdayal, K.**, **Opap, K. B.**, **Siwo, G. H.**, **Adebiyi, M. O.**, **El Gonnouni, A.**, **Zofou, D.**, **Maurady, A. A. M.**, **Adebiyi, E. F.**, **de Villiers, E. P.**, **Masiga, D. K.**, **Bizzaro, J. W.**, **Suravajhala, P.**, **Ommeh, S. C.**, & **Hide, W**. (2010). Ten simple rules for organizing a virtual conference--anywhere. *PLoS Computational Biology*, 6(2), e1000650. 10.1371/journal.pcbi.1000650

Gummer, T., **Roßmann, J.**, & **Silber, H**. (2021). Using instructed response items as attention checks in web surveys: Properties and implementation. *Sociological Methods & Research*, 50(1), 238–264. 10.1177/0049124118769083

Harada, C. N., **Natelson Love, M. C.**, & **Triebel, K. L**. (2013). Normal cognitive aging. *Clinics in Geriatric Medicine*, 29(4), 737–752. 10.1016/j.cger.2013.07.002

Madan, C. R., **Caplan, J. B.**, **Lau, C. S. M.**, & **Fujiwara, E**. (2012). Emotional arousal does not enhance association-memory. *Journal of Memory and Language*, 66(4), 695–716. 10.1016/j.jml.2012.04.001

Nakrošienė, A., **Bučiūnienė, I.**, & **Goštautaitė, B**. (2019). Working from home: Characteristics and outcomes of telework. *International Journal of Manpower*, 40(1), 87–101. 10.1108/IJM-07-2017-0172

Newman, A., **Bavik, Y. L.**, **Mount, M.**, & **Shao, B**. (2021). Data collection via online platforms: Challenges and recommendations for future research. *Applied Psychology*, 70(3), 1380–1402. 10.1111/apps.12302

Palan, S., & **Schitter, C**. (2018). Prolific.ac—A subject pool for online experiments. *Journal of Behavioral and Experimental Finance*, 17(2), 22–27. 10.1016/j.jbef.2017.12.004

Peirce, J., **Gray, J. R.**, **Simpson, S.**, **MacAskill, M.**, **Höchenberger, R.**, **Sogo, H.**, **Kastman, E.**, & **Lindeløv, J. K**. (2019). PsychoPy2: Experiments in behavior made easy. *Behavior Research Methods*, 51(1), 195–203. 10.3758/s13428-018-01193-y

Rotenberg, S., **Maeir, A.**, & **Dawson, D. R**. (2019). Changes in activity participation among older adults with subjective cognitive decline or objective cognitive deficits. *Frontiers in Neurology*, 10, 1393. 10.3389/fneur.2019.01393

Sauter, M., **Draschkow, D.**, & **Mack, W**. (2020). Building, hosting and recruiting: A brief introduction to running behavioral experiments online. *Brain Sciences*, 10(4), 251. 10.3390/brainsci10040251

Scruggs, T. E., **Mastropieri, M. A.**, **Berkeley, S. L.**, & **Marshak, L**. (2010). Mnemonic strategies: Evidence-based practice and practice-based evidence. *Intervention in School and Clinic*, 46(2), 79–86. 10.1177/

SAGE Research Methods: Doing Research Online

1053451210374985

Shamon, H., & **Berning, C. C**. (2020). Attention check items and instructions in online surveys: Boon or bane for data quality?*Survey Research Methods*, 14(1), 55–77.

van Ewijk, S., & **Hoekman, P**. (2021). Emission reduction potentials for academic conference travel. *Journal of Industrial Ecology*, 25(3), 778–788. 10.1111/jiec.13079

van Gerven, P. W. M., **Paas, F. G. W. C**., **Van Merriënboer, J. J. G**., & **Schmidt, H. G**. (2000). Cognitive load theory and the acquisition of complex cognitive skills in the elderly: Towards an integrative framework. *Educational Gerontology*, 26(6), 503–521.