Three ways to make replication mainstream

Morton Ann Gernsbacher
University of Wisconsin-Madison, Madison, WI 53706
MAGernsb@wisc.edu   www.GernsbacherLab.org
ORCID: 0000-0003-0397-3329

Abstract: Zwaan, Etz, Lucas, and Donnelan (2017) argue convincingly that replication needs to be more mainstream. Here, I suggest three practices for achieving that goal: Incremental Replications, which are replications built into each experiment in a series of experiments; Reciprocal Replications, which are reciprocal arrangements of co-replications across labs, and Didactic Replications, which are replications used for training.

Zwaan, Etz, Lucas, and Donnelan (2017) provide convincing arguments for the value of replication – and the need to make replication practices mainstream in psychology. However, due most likely to limits of space rather than limits of vision, Zwaan et al. (2017) stop short of providing concrete steps researchers can take to make replication mainstream. Here, I suggest three practices researchers can adopt to better incorporate replication into their labs.

Incremental replications

We might think of replication as a practice that occurs in a separate lab with different researchers. And the other two replication practices I will discuss can occur that way. But our own studies can also benefit from the verification of replication, within our own lab and within the same studies. An obvious step is to conduct exact replications within a series of experiments (e.g., "Experiment 2: Replication. We tested an additional 120 subjects using the same materials and procedures as we used in Experiment 1," and "Experiment 4: Replication. We tested an additional 120 subjects using the same materials and procedures as we used in [Experiment 3]," Gernsbacher & Hargreaves 1988, p. 704 and 706).

More parsimoniously, we can conduct, within the same study, what I am calling incremental replications. For example, in a series of experiments investigating how readers understand pronouns, I probed participants immediately before versus after they read a pronoun in one experiment. In another experiment, I again probed participants immediately after they read a pronoun, but in this second experiment I also probed them after they finished reading the entire sentence (Gernsbacher 1989). In this way, across experiments but within the same study, I tried to incrementally replicate each of the previously tested probe points (see also Garnham et al. 1996, for a similar approach).

As another example, in a series of priming experiments, we manipulated two types of primes in a first experiment and manipulated again one of those two prime types along with a different prime type in a second experiment (Gernsbacher et al. 2001a). In another series, we manipulated three prime types in a first experiment and repeated two of the three prime types across other experiments (Gernsbacher et al. 2001b). These incremental replications in within-subject designs also allowed us to assess the stability of our previous results in slightly different contexts (the value of which Zwaan et al. highlight).

Incremental replication is also valuable in between-subject designs. For example, in a series of between-subject treatment experiments, we repeated the baseline condition in subsequent experiments with other subjects (and juxtaposed with other treatments), which allowed us to assess the baseline condition's stability (Traxler & Gernsbacher 1992). In another series of experiments, we repeated the control condition in subsequent experiments, which allowed us to assess its stability (Traxler & Gernsbacher 1993).

Reciprocal replications

We might also think of replication as a practice that occurs only after a study has been peer reviewed. However, I would rather receive confirmation (or disconfirmation) of the stability of my results earlier rather than later. Zwaan (2017), in material left on the target article's editing floor, describes how this can be done.

> A research group formulates a hypothesis that they want to test. At the same time, they desire to have some reassurance about the reliability of the finding they expect to obtain. They decide to team up with another research group. They provide this group with a protocol for the experiment, the program and stimuli to run the experiment, and the code for the statistical analysis of the data. The experiment is preregistered. Both groups then each run the experiment and analyze the data independently. The results of both studies are included in the article, along with a meta-analysis of the results.

Zwaan (2017) calls this practice as concurrent replication, and my recommendation goes one step further: Make the process reciprocal. Lab A attempts to replicate Lab B's study, while Lab B is doing the same for Lab A's study. Platforms such as *StudySwap* (deemed "a Craigslist for researchers" by Nosek in Chawla 2017) and *Psychological Science Accelerator* are ideal for reciprocal replication. Reciprocal replications should take some of the adversarial sting out of traditional replications.

Didactic replications

Lastly, we can make replication more mainstream by embracing it as a training tool. When I was a first-year doctoral student, in one of my first meetings with my advisor, he walked to his filing cabinet, pulled out a recently published article, and sug-

gested I spend my first semester trying to replicate the results. The fact that this didactic activity occurred nearly 40 years ago might be surprising. More surprising might be the fact that the first author of the study my advisor tasked me to replicate was, indeed, my advisor (Foss & Blank 1980).

As it turned out, the previous study only partially replicated (Foss & Gernsbacher 1983). Learning how to execute an experiment from a published article was an incredibly valuable training experience. (Most likely this is why beginning cooks are encouraged to follow a recipe precisely, before adding their own flourishes.) Deciphering why the previous study only partially replicated was an even more valuable training experience. I believe I learned more about experimental design, stimulus creation, and the myriad other steps involved in doing good science than I would have learned had I joined an in-process study or tried to generate a new study from scratch.

The didactic value of replication has been advocated by others, most notably Grahe and his "Collaborative Replications and Education Project" (Grahe et al. 2014). Along with Incremental Replications, which are replications built into each of a series of experiments to attempt to replicate parts of previous experiments, and Reciprocal Replications, which are reciprocal arrangements of co-replication, Didactic Replications can make replication more mainstream.

References

Chawla, D. S. (2017, April 7) Online platform aims to facilitate replication studies. *The Scientist.* https://www.the-scientist.com/?articles.view/articleNo/49161/title/Online-Platform-Aims-to-Facilitate-Replication-Studies/

Foss, D. J. & Blank, M. A. (1980) Identifying the speech codes. *Cognitive Psychology* 12:1-31. https://doi.org/10.1016/0010-0285(80)90002-X

Foss, D. J. & Gernsbacher, M. A. (1983) Cracking the dual code: Toward a unitary model of phoneme identification. *Journal of Verbal Learning and Verbal Behavior* 22:609-32. https://doi.org/10.1016/S0022-5371(83)90365-1

Garnham, A., Traxler, M., Oakhill, J. & Gernsbacher, M. A. (1996) The locus of implicit causality effects in comprehension. *Journal of Memory and Language* 35:517-43. https://doi.org/10.1006/jmla.1996.0028

Gernsbacher, M. A. (1989) Mechanisms that improve referential access. *Cognition* 32:99-156. https://doi.org/10.1016/0010-0277(89)90001-2

Gernsbacher, M. A. & Hargreaves, D. J. (1988) Accessing sentence participants: The advantage of first mention. *Journal of Memory and Language* 27:699-717. https://doi.org/10.1016/0749-596X(88)90016-2

Gernsbacher, M. A., Keysar, B., Robertson, R. R. W. & Werner, N. K. (2001a) The role of suppression and enhancement in understanding metaphors. *Journal of Memory and Language* 45:433-50. https://doi.org/10.1006/jmla.2000.2782

Gernsbacher, M. A., Robertson, R. R. W. & Werner, N. K. (2001b) The costs and benefits of meaning. In: *On the consequences of*

meaning selection: Perspectives on resolving lexical ambiguity, ed. D. S. Gorfein, pp. 119-37. APA. https://doi.org/10.1037/10459-007

Grahe, J., Brandt, M., IJzerman, H. & Cohoon, J. (2014, February 28) Replication education. *Association for Psychological Science: Observer.* https://www.psychologicalscience.org/observer/replication-education

Traxler, M. J. & Gernsbacher, M. A. (1992) Improving written communication through minimal feedback. *Language and Cognitive Processes* 7:1-22. https://doi.org/10.1080/01690969208409378

Traxler, M. J. & Gernsbacher, M. A. (1993) Improving written communication through perspective-taking. *Language and Cognitive Processes* 8:311-34. https://doi.org/10.1080/01690969308406958

Zwaan, R. (2017, May 8) Concurrent replication. RolfZwaan [blog]. https://rolfzwaan.blogspot.co.at/2017/05/concurrent-replication.html

Zwaan, R. A., Etz, A., Lucas, R. E. & Donnelan, M. B. (2017) Making replication mainstream. Behavioral and Brain Sciences, 25:1-50. https://doi.org/10.1017/S0140525X17001972