

# Open Research Case Study

## “If at first you don’t succeed...” Using public pre-registration when replicating published research

Courtney Neal

PhD Researcher, Population Health Sciences Institute

The replication crisis in the psychological sciences is well-documented, as is the idea that open research practices are key to overcoming it. I have decided to be part of the solution from the start of my research career.

For my first PhD study, I attempted to replicate a well-cited cognitive effect in my area of interest. I collaborated with the original authors to closely replicate their experiment, access original stimuli, and confirm design details missing from their published report. Had the authors pre-registered their work in detail, they would not have had to dig through patchy files from a decade ago to answer questions about their protocol and analyses. I would not have had to fill remaining gaps using guesswork informed by our correspondence.

To prevent history repeating itself, I pre-registered my protocol, planned analyses, and specific predictions for a successful replication on the Open Science Framework (OSF) before collecting data (links below). This discouraged unintentional HARKing and data dredging, as research outputs were pre-determined. Consequently, my pre-registration report is an important component of a public timeline recording how my study developed with full transparency. It is a rich information source for future research. In time, I will further improve this record by adding code for my experiment and analyses, and my data.

Pre-registering also helped to mitigate uncertainty when COVID-19 forced my replication of the original, in-person study to run online. This move created uncertainty in determining an appropriate sample size to achieve sufficient statistical power without under or oversampling. To overcome this, I employed a statistical rule that allowed data ‘peeking’ during sampling and identified when enough evidence had been collected to support a conclusive outcome and stop sampling. I pre-registered the statistical conditions required by the rule to stop sampling to prevent potential accusations of misconduct. Since these methods deviated from the original study, I pre-registered my analytical methods and criteria for successful replication in detail. I also committed to running the original analyses, in addition to my own, for interpretive clarity.

Because of the uncertainty associated with moving the experiment online, I also explicitly preregistered my intentions for a second, in-person replication attempt if my results did not meet the criteria for successful replication. This came to be true; had I not pre-registered my plans, the results from my first replication attempt may have become part of the ever-growing file drawer problem by virtue of their ‘null’-ness.

Before running my second, in-person replication attempt, I pre-registered a report on the OSF, with the same level of detail as my first. However, I did not commit to running another replication if this attempt was also unsuccessful. When my in-person results supported my online results, I was satisfied I had not replicated the published effect and had fulfilled my pre-registered commitments.

My fellow students have told me of their desire to pre-register their research but comment they do not have time. Conversely, I have learned to save time through pre-registration. The accountability associated with public planning required me to deeply understand my research at a much earlier stage. By pre-registering, I considered the minutiae of my hypotheses, experimental conditions, measures, and procedures, resulting in higher quality output, and more efficient data collection and analyses.

My fellow students have told me of their desire to pre-register their research but comment they do not have time. Conversely, I have learned to save time through pre-registration. The accountability associated with public planning required me to deeply understand my research at a much earlier stage. By pre-registering, I considered the minutiae of my hypotheses, experimental conditions, measures, and procedures, resulting in higher quality output, and more efficient data collection and analyses. Furthermore, I had written analysis scripts before I had data, removing the opportunity for unsavoury data handling. There were ethical benefits, too, as I did not use more participant time, effort, or data than was necessary to achieve my clearly defined research goals.

Furthermore, I had written analysis scripts before I had data, removing the opportunity for unsavoury data handling. There were ethical benefits, too, as I did not use more participant time, effort, or data than was necessary to achieve my clearly defined research goals.

My pre-registration is a public paper trail accompanying my research journey. My transparency may make my questioning of the published effect of interest more convincing to others, especially since an identical replication is rarely, if ever, possible. Pre-registration may reduce the likelihood of positive-result publication bias against my work and make it more desirable to a journal committed to publishing replication studies regardless of outcome. Critically, my pre-registrations give detailed information about existing work, without a paywall, to the research community.

I believe by engaging in open research practices I have become a more thoughtful researcher capable of higher quality research. I have faced the shortcomings of my research at an early stage, made improvements when I could, and better understood limitations when I could not. These practices promote honesty and transparency in research. Both should be a given but are unfortunately not.

## References

1. Online replication attempt: <https://osf.io/w2a8f>
2. In-person replication attempt: <https://osf.io/v4wpt>