Dissociating memory accessibility and precision in forgetting: writing a Registered Report

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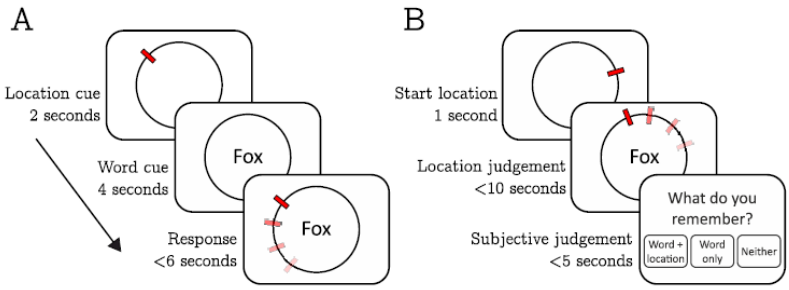

^ Schematic of the experimental procedure, taken from the study preprint.

Summary

Imagine you parked the car before going away on holiday. When you return you try to remember where you parked it only to realise you have forgotten. We always seem to be forgetting information we would rather remember, but we know little about how and why forgetting occurs. In the case of your car, one possibility is that you completely forget the location and have to search the whole carpark. Another possibility is that your memory becomes 'blurry' – you remember roughly where you left if but not as precisely as before. We tackled this question in a Registered Report, acquiring a large sample of online data from healthy human participants. We tracked memory for word locations over the course of several days, finding that participants forgot locations in their entirety, with little evidence that memories become 'blurry' over time.

Case Study

Forgetting is an inevitability. We often forget information, sometimes rapidly and sometimes over the course of days-to-years. Although psychologists have extensively studied the rate of forgetting and what causes forgetting, we still know little about whether memories change over time as a function of forgetting. We set out to investigate this question by assessing whether your memory for specific locations becomes 'blurry' over time, or instead whether you forget locations in their entirety.

We wanted to publish this study as a "Registered Report", where you submit a manuscript including an introduction and methods section before you collect any data. Reviewers give feedback on the experimental design, and you receive an "in principle acceptance" from the journal, where they agree to publish the results if you conduct the experiment as you said you would. Critically, this acceptance is regardless of the eventual results, so is designed to decrease journal-level bias where "positive" results are more likely to be published than null results.

Receiving “in principle acceptance” required a lot of piloting of a novel experimental approach and a lot of work in developing a novel metric for assessing the two types of forgetting that we outlined. During the review process we also switched from a more typical null hypothesis significance testing to a Bayesian approach, allowing us to provide evidence in favour of potential null results. Following ‘in principle acceptance’, we acquired a large online dataset (N=431) assessing our specific predictions. Contrary to our expectations, we saw no evidence for “blurring” – participants forgot specific word-locations but when they did remember the location it was remembered as precisely as it was when first learnt. We also assessed how forgetting was affected by an underlying “pattern” in the data, where semantically related words were spatially grouped. Although this grouping affected memory performance, it did not appear to affect the pattern of forgetting.

The project was our first Registered Report, and the learning curve was relatively steep. The dynamic with reviewers, where they contribute to the experimental design prior to data collection, is different from a typical review process. The burden of proof in relation to obtaining ‘in principle acceptance’ shifts from persuading reviewers of the quality of the data and results in a “normal” publication process to persuading the reviewers that your experimental design and statistical analyses will likely produce high quality data and allow for clear theoretical conclusions to be drawn. Overall, the process was highly rewarding, and we have since submitted another Registered Report on a related topic. However, the project required both time and money to be able to acquire such a large dataset, and this would not likely have been possible without external grant funding (in this case from the Wellcome Trust and ESRC).

The published Registered Report was awarded the British Psychological Society Cognitive Section Award 2021, with the awards committee commenting that the “paper presents a novel finding that will stimulate a huge amount of research to better understand what it means for models of memory. It provides a useful framework for understanding memory impairments in clinical populations and represents best practice in terms of open science.”

Links

- Berens, S.C., Richards, B.A., & Horner, A.J., (2020) *Dissociating memory accessibility and precision in forgetting*, **Nature Human Behaviour**, 4, 866–877: https://doi.org/10.1038/s41562-020-0888-8
- Published manuscript: https://pubmed.ncbi.nlm.nih.gov/32514041/
- Preprint: https://psyarxiv.com/e8w7b/
- Data and scripts for experiment and statistical analyses: https://osf.io/8mzyc/

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