

## The Hypercorrection Effect

We are much more likely to remember corrective feedback when we were confident that our initial response was correct compared to responses that were guesses.

## Why is it Interesting?

**Counterintuitive:** Confidence in a response reflects our metacognitive awareness of what we already know. It would be expected that established memory traces should be more difficult to change. The Hypercorrection Effect indicates this is not the case!

## Why Might the Effect Occur?

**Arousal:** Unexpectedly being told you have made an error is arousing. Arousal might enhance recall directly (Butterfield and Metcalfe, 2001).

**Violations of Expectancies:** Learning is greater the greater the discrepancy between expectations and outcomes. With a guessed answer, the expectation it is correct is low, with a confident answer the expectation it is correct is high. Hence being told you have made an error violates your expectations that you will be told you are correct. (c.f. Rescorla and Wagner, 1972)

**Attention:** Surprising events attract attention, which leads to greater encoding of these events. Hence encoding of the unexpected feedback is enhanced (Butterfield & Mangels, 2003).

**The von Restorff Effect:** Making an error when you are confident you are correct is rare. Rare or unusual events are better recalled.

## Methodological Problem and a Solution

High confidence errors in most test materials are rare, hence confidence and error frequency are always confounded.

BUT

What if the question bank contained a large number of items that people typically believe in the wrong answer such as "Urban Myths"?

Participants will make many errors (>50% in pilot testing) and will also be very confident in many of these responses.

## Aims

To separate the effect of metacognitive mismatch from simple rarity, and thus rule out the von Restorff effect as an explanation of the Hypercorrection Effect.

To determine if unexpected error feedback results in general increases in arousal which might be linked to enhanced encoding of feedback.

To determine if metacognitive mismatch results in enhanced P3 ERP frequently associated with attentional resource allocation.

## Method

### Question Bank

190 True or False questions. Eg:

*Sharks drown if they fall asleep.*

*Birds will abandon their babies if they detect a humans scent.*

*Mice like cheese.*

*Giving children sugar will make the child hyperactive.*

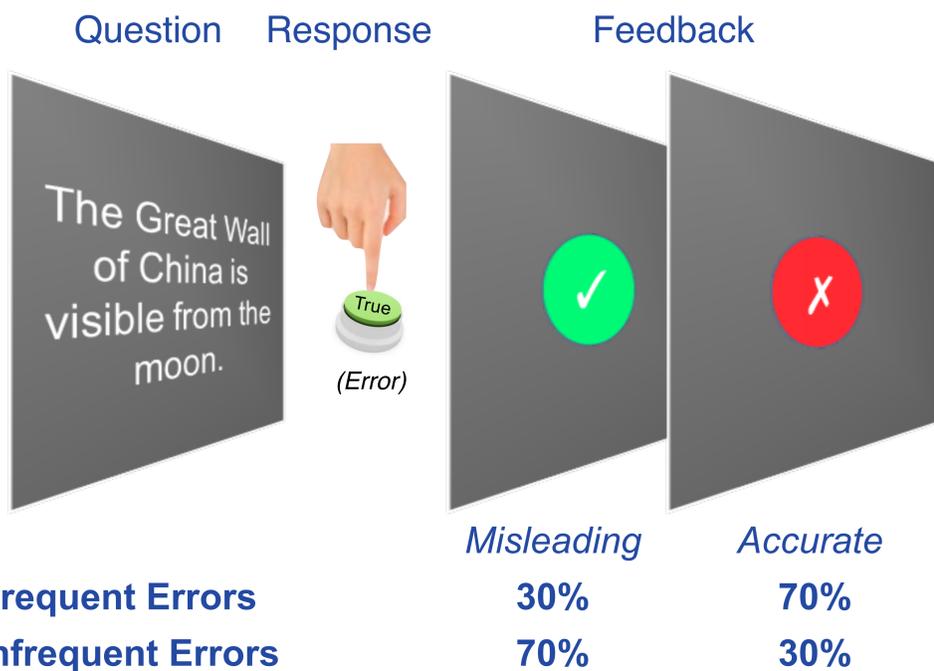
### Procedure

ERP and GSR were recorded time linked to the onset of feedback.

Error Frequency was manipulated by providing false feedback to some incorrect responses.

Participants were randomly allocated to high or low frequency errors conditions.

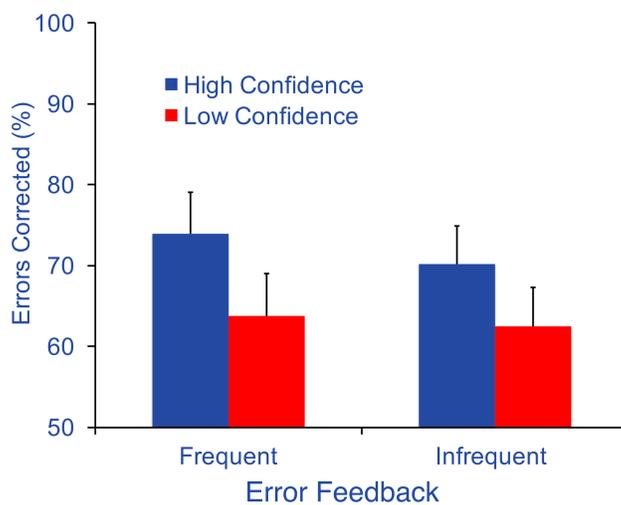
## Experimental Conditions



(N = 18) Frequent Errors

(N = 18) Infrequent Errors

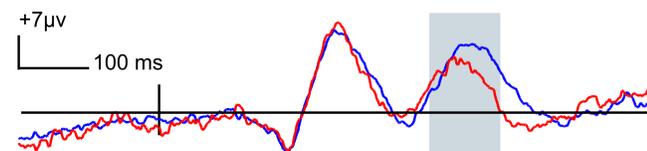
## Behavioural Data



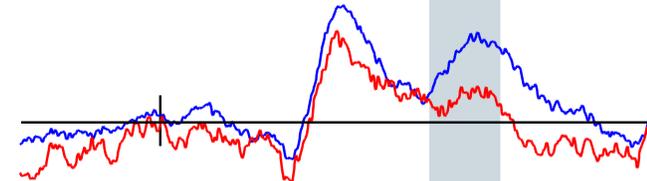
The mean percentage of errors corrected at post-test following error feedback in the learning phase. High confidence resulted in significantly ( $p = .006$ ) greater improvement in performance. No effect of error frequency.

## ERP Data

### Frequent Errors Feedback

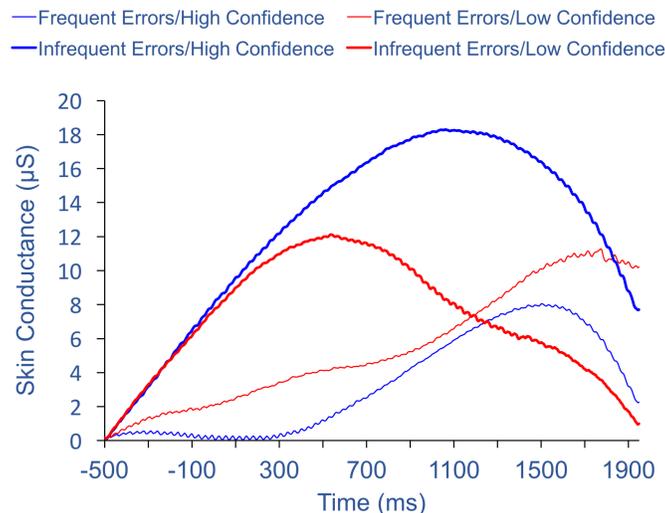


### Infrequent Errors Feedback



Evoked Response Potentials at Cz. The presentation of error feedback following a high confidence error significantly ( $p < .007$ ) enhanced the ERP response between 375 - 475 ms post feedback onset.

## GSR Data



Galvanic Skin Response to feedback onset. While it appears that infrequent errors result in greater autonomic responsiveness, there were no significant differences between conditions.

## Conclusions

Hypercorrection of errors **does not** depend on the rarity of unexpected errors. Good evidence hypercorrection is not a special case of the von Restorff Effect.

Metacognitive mismatch results in an enhanced P3 waveform rather than stimulus novelty. Hence it is not just a simple surprise response to an unusual event but is a response to an unexpected event.

Arousal data is inconclusive due to highly variable responses.

Hypercorrection does appear to result from metacognitive mismatch with circumstantial evidence for attention being directed to the unexpected feedback enhancing encoding.

## References

- Butterfield, B., & Mangels, J. A. (2003). Neural correlates of error detection and correction in a semantic retrieval task. *Cognitive Brain Research*, 17(3), 793-817. doi:10.1016/S0926-6410(03)00203-9
- Butterfield, B., & Metcalfe, J. (2001). Errors committed with high confidence are hypercorrected. *Journal of Experimental Psychology*, 27(6), 1491-1494. doi: 10.1037/0278-7393.27.6.1491
- Rescorla, R. A., & Wagner, A. R. (1972). A theory of Pavlovian conditioning: Variations in the effectiveness of reinforcement and non-reinforcement. In A. H. Black & W. F. Prokasy (Eds.), *Classical conditioning II: Current research and theory* (pp. 64-99). New York: Appleton-Century-Crofts.