# The Mirror Effect within Perception: Not another Recognition Memory Study

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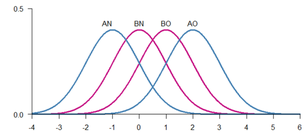
## Introduction: A memory phenomenon?

Signal Detection Theory has been applied to Recognition Memory studies to describe subjects' ability to discriminate between stimuli that have been presented before from a new set of stimuli (Wixted, 2007). When comparing subjects' performance between two classes of stimuli, one being more easily recognized (A) than the other (B), the response patterns obtained show that the difference in their discriminability is reflected in the identification of both target and lure stimuli, leading to its identification as the Mirror Effect (Glanzer, Adams, Kim, 1993).




Evidence in favor of the Mirror Effect has been reported across different SDT-alike procedures. In typical Yes/No tasks, it appears as:

$$FA(A) < FA(B) < Hits(B) < Hits(A) \quad (1)$$

In Confidence Rating procedures, it has been found that:

$$R(AN) < R(BN) < R(BS) < R(AS) \quad (2)$$

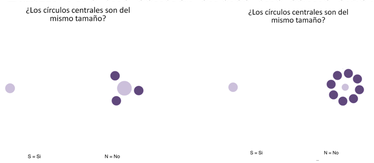
However, the Mirror Effect has only been studied within Recognition Memory and so, most theories and models proposed to explain it tend to do it in terms of high-level processes engaged in the study phase. The main goal of the present study was to explore the existence of the Mirror Effect outside Recognition Memory, thus testing these assumptions.

## Method: A perceptual task

**Ebbinghaus illusion: Two levels of perceptual discriminability** (Massaro, 1971).

- High accuracy (A): 2 or 3 surrounding circles.
- Low accuracy (B): 7 or 8 surrounding circles.

1. **Detection Task:** Are the central circles the same size?




2. **Confident Rating:**

**Two experiments:**

- Experiment 1: Just the right circle was an Ebbinghaus illusion.
- Experiment 2: Both circles were constructed as Ebbinghaus illusions.

**Technical details:**

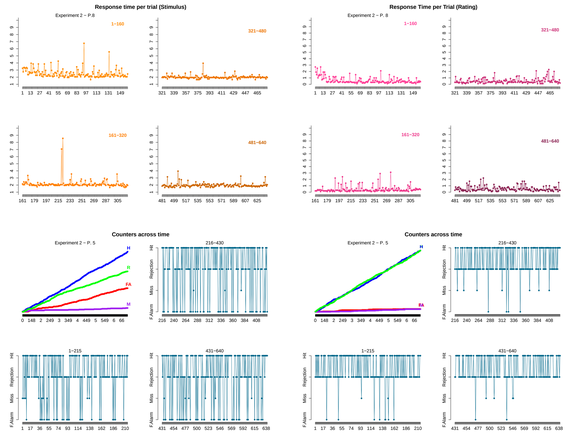
- 640 trials (total)
- 1.5 s exposure

## What did we find? (Spoiler alert!)

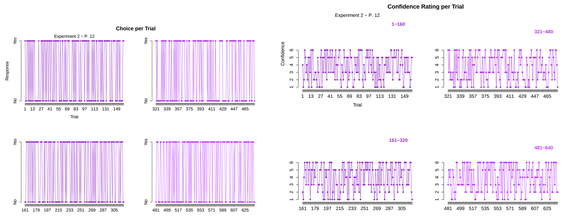
We had 20 and 21 participants on Experiments 1 and 2 respectively. In both cases, we found evidence for the Mirror Effect in at least 85% of the participants. In Experiment 1, we had 17 cases showing the Mirror Effect pattern within the hit and false alarm rates and 18 in terms of Confidence Ratings. In Experiment 2 we had 19 participants showing the Mirror Effect in both patterns of response. All these proportions have proven to be of great significance against chance when we apply a simple Binomial Test (p=0.0025 and p=0.0004, for Experiment 1, and p=0.0002 for Experiment 2).

## Plotting our data.

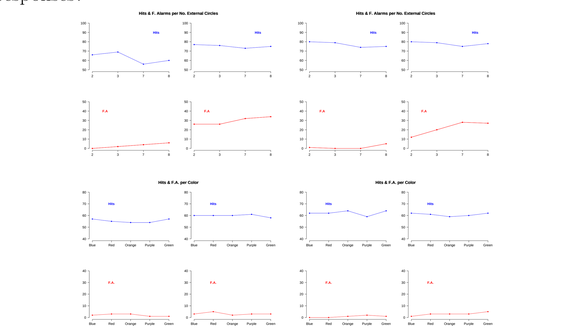
- Are there changes in participants' performance across time?




- Are participant's actually paying attention?

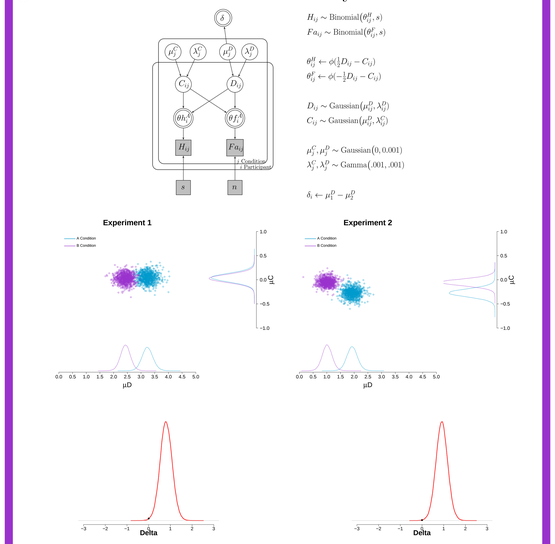



- Are the variables involved within stimuli affecting participants' responses?

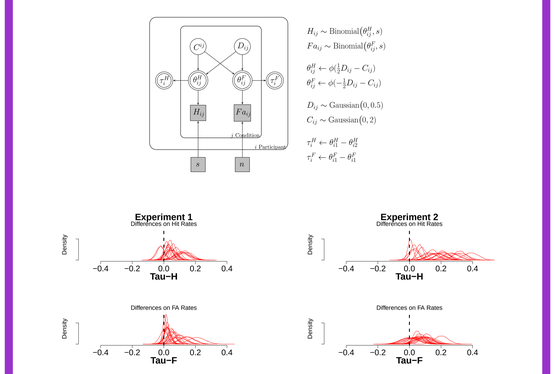



## Bayesian Modeling

1. D' differences: Are conditions actually different?




2. Hit and False Alarm Rate Differences




## Acknowledgments & Contact Information

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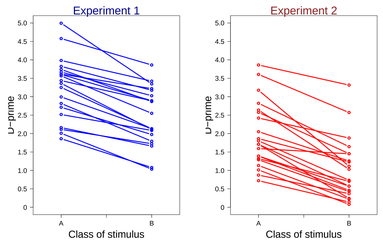
## Classical Analysis

1. D' differences: Are conditions actually different?




| T-test | μ A | μ B | T | P value |
|---|---|---|---|---|
| Experiment 1 | 3.2403 | 2.44895 | -3.0587 | 0.002034 |
| Experiment 2 | 1.950238 | 1.022381 | -3.4972 | 0.0005853 |

2. Differences across Hit and False Alarm Rates

| T-test . | | μ A | μ B | T | P value |
|---|---|---|---|---|---|
| Exp 1 | Hits | 0.9225 | 0.8609375 | -2.4348 | 0.00989 |
| Exp 1 | FA | 0.08 | 0.14375 | 1.917 | 0.03148 |
| Exp 2 | Hits | 0.853869 | 0.6782738 | -3.4757, | 0.0006423 |
| Exp 2 | FA | 0.2681548 | 0.3366071 | 1.769 | 0.04254 |

3. Mean Confidence Rating per class of stimuli

| T-test . | | μ A | μ B | T | P value |
|---|---|---|---|---|---|
| Exp 1 | Signal | 5.445312 | 5.212813 | -1.7778, | 0.04185 |
| Exp 1 | Noise | 1.542812 | 1.883437 | -1.7208 | 0.04724 |
| Exp 2 | Signal | 5.183333 | 4.342857 | -3.6752, | 0.0004103 |
| Exp 2 | Noise | 2.386905 | 2.752381 | -1.809 | 0.03919 |

. Glanzer & Adams (1993)

## Conclusion

The present study is the first to show evidence of the Mirror Effect patterns of response on a SD task that does not involve recognition memory. The perceptual task here presented lacked a pre-experimental phase where participants had the chance to manipulate how powerful were the illusions elicited in each condition suggesting that there might be a much more basic principle regulating the observed pattern of responses.

## References

- Glanzer, M., Adams, J. (1990) The Mirror Effect in Recognition Memory Data and Theory. Journal of Experimental Psychology: Learning, Memory and Cognition. Vol. 16. No. 1, 5-16.
- Glanzer, M., Adams, J., Iverson, G. & Kim, K. (1993) The Regularities of Recognition Memory. Psychological Review. Vol. 100. No. 3. 546-567.
- Massaro, D., Anderson, N. (1971). Judgmental model of the Ebbinghaus Illusion. Journal of Experimental Psychology. Vol. 89. 147 - 151