

# Putting on Your Thinking Cap: Priming Scientific Reasoning Produces Critical but Biased Evaluations of Scientific Evidence

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## Abstract:

The motivation to maintain beliefs causes individuals to evaluate evidence in a biased manner [1]. In two online samples, we examine how asking participants to complete a scientific reasoning task [2] before reading scientific evidence that supports or opposes their beliefs affects the degree of bias in their evaluation of that evidence. We find that the task, meant to encourage a scientific perspective, had no effect on participants' degree of bias, but did lower their opinion of both types of evidence. These results suggest that a more analytical perspective may make people more skeptical overall, but no less biased.

## Introduction:

- Individuals evaluate contrary evidence more critically than consistent evidence [1], termed ***myside bias*** [3].
- Evaluating scientific evidence requires analytical ***scientific reasoning*** skills [2]

**Research Question:** How will priming scientific reasoning skills affect myside bias in the evaluation of scientific evidence?

## Hypotheses:

| Theory                  | Predicted Effect of Priming                                               | Effect on Myside Bias |
|-------------------------|---------------------------------------------------------------------------|-----------------------|
| Dual-process theory [4] | Aid analytical reasoning to override belief-driven associative processing | Decrease              |
| Motivated reasoning [1] | Promote usage of analytical reasoning to support myside conclusions       | Increase              |



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## General Methods: Studies 1 and 2

### Participants

- Recruited via Qualtrics Panels (Study 1) and Mechanical Turk (Study 2)
- Used 5-item screening test to recruit equal numbers of Affordable Care Act (ACA) opponents and supporters

### Experimental Design:

1. **Evidence Condition:** Read science news-style article about 1 of 2 real scientific studies [5,6] that used similar methods and datasets but found opposing effects of the ACA.
  - Randomly assigned to read evidence that **supports** or **opposes** their ACA beliefs:

| Study: Health Care More Affordable for Many Young Adults                                                                                      | Study: Health Care Remains Unaffordable for Many Young Adults                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A new study has found that <b>fewer young adults are putting off or choosing not to get medical care</b> after the Affordable Care Act (ACA). | A new study has found that <b>young adults are no more likely to be able to afford prescription medication and physician visits</b> after the Affordable Care Act (ACA). |
| A provision in the ACA allows young adults to stay on their parents' health insurance until the age of 26...<br>[article continues]           | A provision in the ACA allows young adults to stay on their parents' health insurance until the age of 26...<br>[article continues]                                      |

2. **Priming Condition:** Completed 11 scientific reasoning problems (the Scientific Reasoning Scale (SRS) [2]) *before* reading the article (**Priming Condition**) or *after* (**Control Condition**).
  - Study 2 included additional **Numeracy Condition**: completed 11-item numeracy test [7], instead of SRS, *before* reading the article.

### Dependent Measures

- *Judgments of the Evidence* (Study 1 and 2): Rated agreement with 6 statements about convincingness and quality of the evidence in the article, on 7-point Likert scale (Cronbach's  $\alpha = 0.91$ )
- *Limitations of the Evidence* (Study 2): "Which of the following is the best criticism that can be made of this study?" Only 1 of 3 choices is supported by the information given in the article.

## References

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## Study 1: Results

1. Participants displayed predicted ***myside bias***
2. Priming scientific reasoning caused ***more critical judgments*** of the evidence

| <i>Judgments of the Evidence, by Condition</i> |          |         |
|------------------------------------------------|----------|---------|
|                                                | Model 1  | Model 2 |
| Evidence Supports Beliefs                      | 0.25*    | 0.16    |
| Priming Condition                              | -0.36*** | -0.45** |
| Supports Beliefs * Priming Condition           |          | 0.18    |
| Constant                                       | 5.67***  | 5.70*** |
| R <sup>2</sup>                                 | 0.11     | 0.11    |
| F                                              | 9.4***   | 8.4***  |

Note: N = 605. Linear regression including as covariates age, education, gender, political conservatism, and score on the Scientific Reasoning Scale. Composite judgments of the evidence reported on a 7-point scale, with higher scores corresponding to higher ratings of the evidence. . \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

## Study 2: Results

1. Priming ***critical non-scientific thinking*** with a numeracy test did not affect judgments:

| <i>Judgments of the Evidence, by Condition</i> |         |         |
|------------------------------------------------|---------|---------|
|                                                | Model 1 | Model 2 |
| Evidence Supports Beliefs                      | 0.59*** | 0.63*** |
| Priming Condition                              | -0.11   | -0.12   |
| Numeracy Condition                             | -0.14   | -0.08   |
| Supports Beliefs * Priming Condition           |         | 0.02    |
| Supports Beliefs * Numeracy Condition          |         | -0.12   |
| Constant                                       | 5.43*** | 5.40*** |
| R <sup>2</sup>                                 | 0.13    | 0.13    |
| F                                              | 14.6*** | 12.0*** |

Note: N = 870. Linear regression including as covariates age, education, gender, political conservatism, score on the Scientific Reasoning Scale, and score on the numeracy test. Composite judgments of the evidence reported on a 7-point scale, with higher scores corresponding to higher ratings of the evidence. . \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

2. In a cumulative meta-analysis [8] of data from Study 1 and 2, linear regressions indicated a significant effect of Priming Condition ( $\beta = -0.19$ ,  $p < 0.01$ )
3. Priming scientific reasoning ***improved ability to identify a limitation*** of the evidence:

| <i>Likelihood of Correctly Identifying Limitation of Evidence, by Condition</i> |         |         |
|---------------------------------------------------------------------------------|---------|---------|
|                                                                                 | Model 1 | Model 2 |
| Evidence Supports Beliefs                                                       | 0.19    | 0.24    |
| Priming Condition                                                               | 0.50*   | 0.58*   |
| Numeracy Condition                                                              | -0.04   | -0.04   |
| Supports Beliefs * Priming Condition                                            |         | -0.14   |
| Supports Beliefs * Numeracy Condition                                           |         | -0.01   |
| Constant                                                                        | -0.66   | -0.69   |
| AIC                                                                             | 952     | 956     |

Note: N= 870. Logistic regression including as covariates age, education, gender, political conservatism, score on the Scientific Reasoning Scale, and score on the numeracy scale. . \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

## General Discussion

- Inducing a more analytical perspective may make people more critical overall, but no less biased
- Results did not support the predictions of either dual-process theory or motivated reasoning

For additional information regarding this poster, please contact Caitlin Drummond at cdrummond@cmu.edu.