

# Scientific reasoning as a predictor of performance on hypothetical inference questions

Tricia A. Guerrero, Thomas D. Griffin, & Jennifer Wiley  
University of Illinois at Chicago

## Background

Inferences that are not required to maintain coherence are seldom made during online reading (McKoon & Ratcliff, 1992; Singer et al., 1997)

- But often used to test comprehension after reading
- Readers may not have developed mental model necessary to respond to them

### Hypothetical Inferences

- Prompt the reader to apply knowledge to a new situation or context

*Suppose/Imagine that..., What if...*

- Past research has shown that these type of questions are extremely difficult and do not benefit from common generative activities (Guerrero et al., 2018)

Giving readers a goal prior to reading may help them to understand the depth of processing necessary to answer questions (Britt et al., 2018; Narvaez et al., 1999).

- Test expectancies have been useful in increasing comprehension and comprehension monitoring (Griffin et al., 2019)

## Research Goals

**E1- Are findings of low performance replicated with new materials?**

**E2- What cognitive abilities are involved in generating responses to hypothetical inferences?**

**E3- Does providing students with a test expectancy prior to reading lead to comprehension increases especially on questions that require hypothetical inferences?**

## Materials

Text about the chemical process of fermentation and production of alcohol

- 1,350 words
- Written at 11<sup>th</sup> grade level

### 5 Text-Based Questions (MC)

What are the byproducts of fermentation?  
*Answer located directly in text.*

### 5 Bridging Inference Questions (MC)

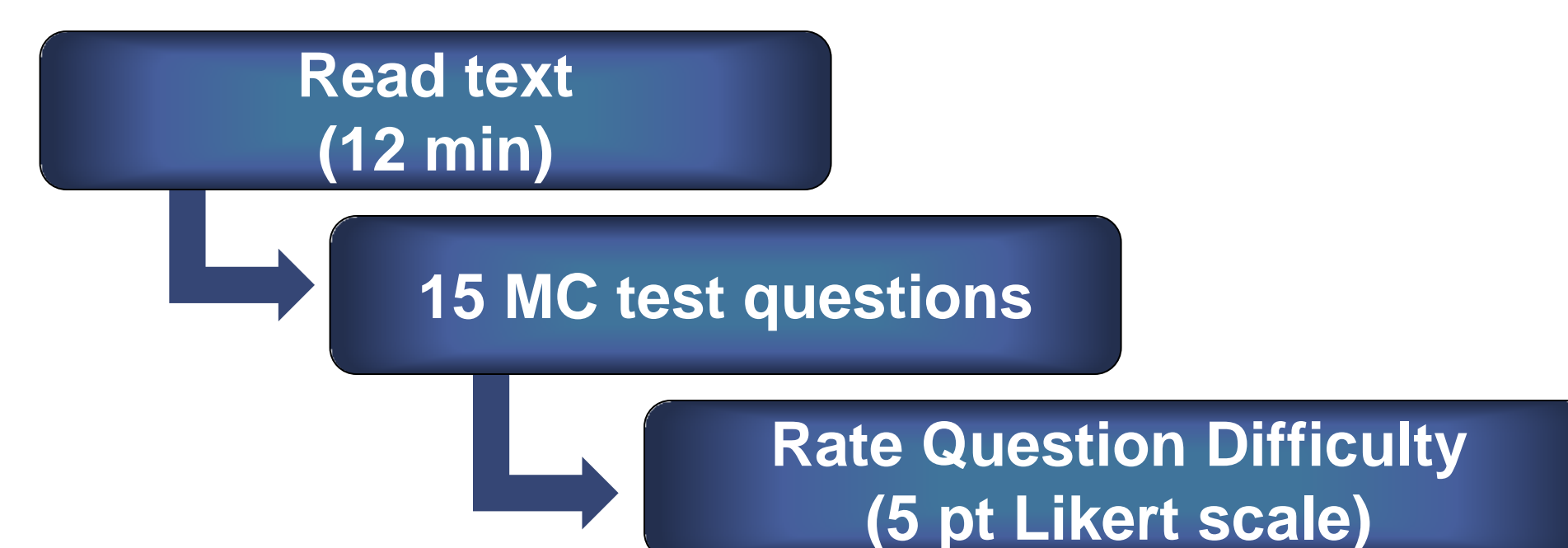
If yeast cells have a low attenuation, what is most likely to happen to the beer or wine?  
*Answer can be inferred from a few sentences within the text.*

### 5 Hypothetical Inference Questions (MC)

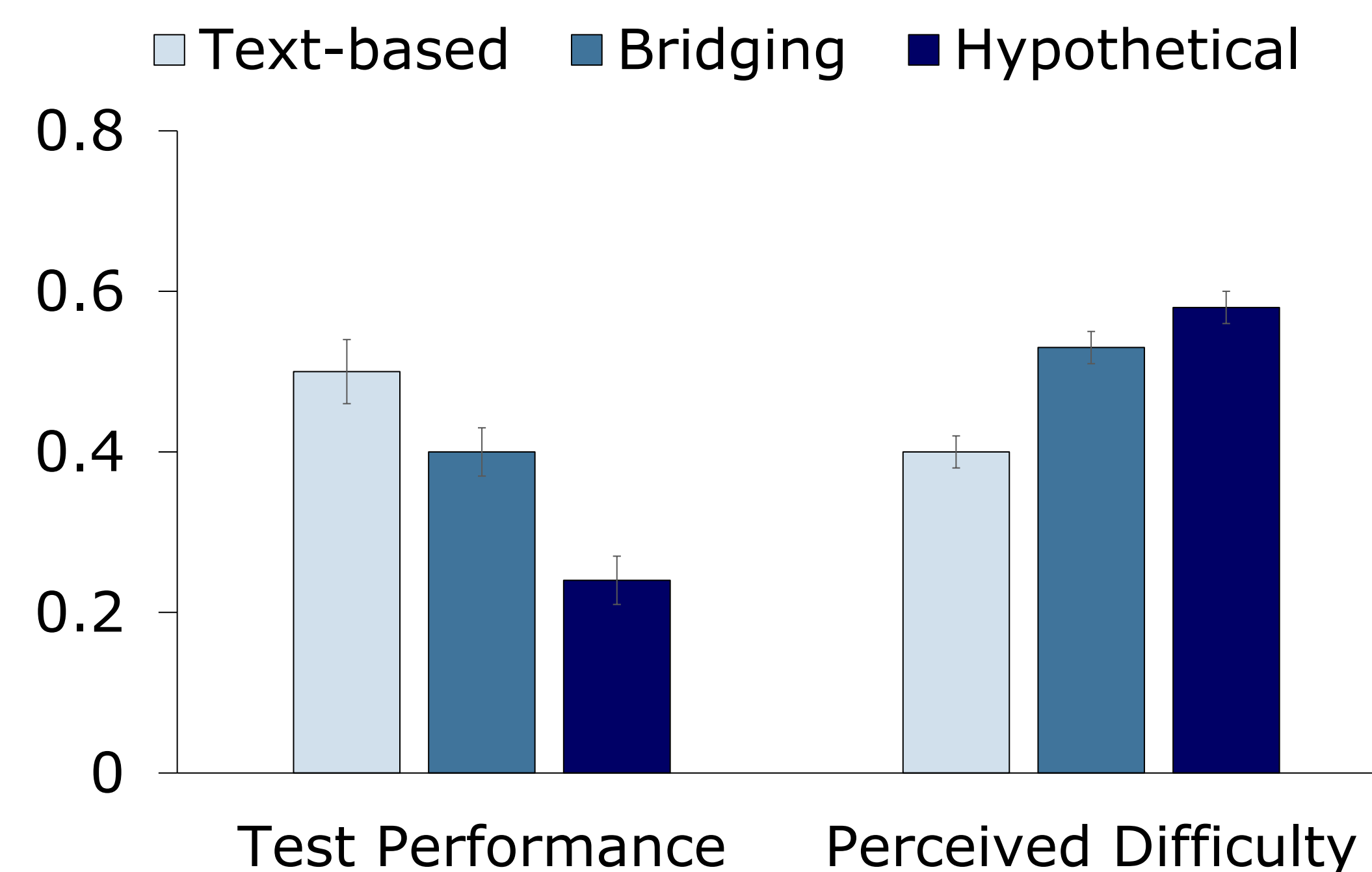
Suppose a baker incorrectly doubled the amount of sugar in the bread recipe. Besides making the bread sweeter, how this would affect the fermentation process and the final product?  
*Answer and context not found directly in text, but the necessary information to infer the answer is available in the text.*

## Experiment 1

54 undergraduates

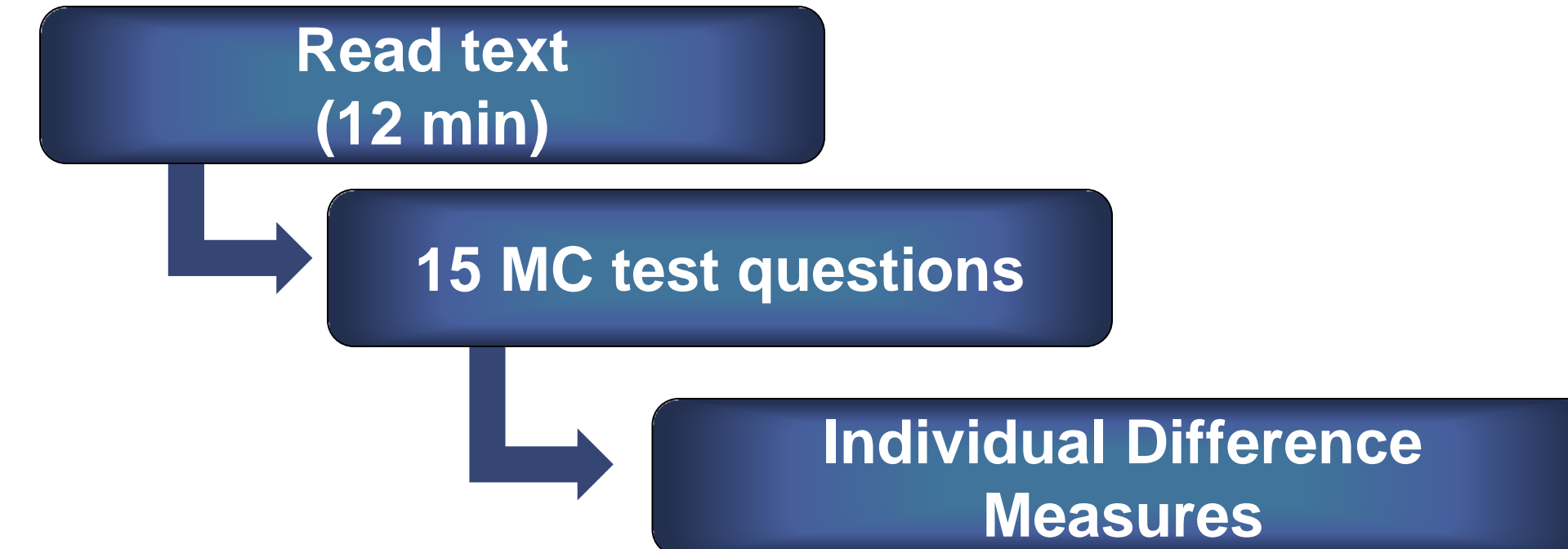


**Hypothetical inferences were more difficult and were perceived to be more difficult than TB & Bridging inferences**



## Experiment 2

56 undergraduates



Reading Factor: Vocabulary, ACT, Prior Knowledge  
Memory Factor: Picture Span, Mental Counters  
Reasoning Factor: Lawson CTSR, Paper Folding, Figural Analogies

**Reasoning Factor was the only unique predictor of the ability to answer hypothetical inference questions.**

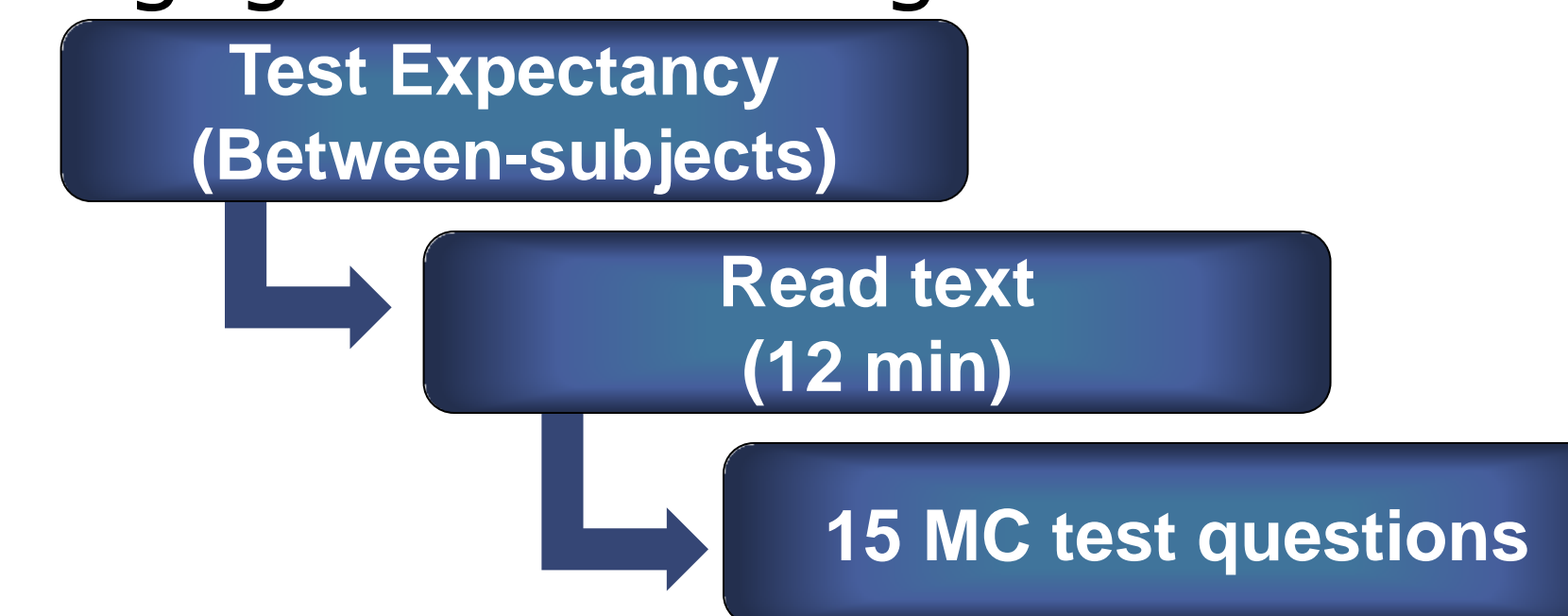
	Factors	B	SE	t	p
TB	Reading	.08	.04	2.20	.03*
	Memory	-.01	.03	-.27	.79
	Reasoning	.07	.04	1.66	.11*
Bridging	Reading	.06	.04	1.39	.17*
	Memory	.05	.04	1.19	.24*
	Reasoning	.06	.06	1.29	.20*
Hypothetical	Reading	.05	.04	1.26	.21*
	Memory	-.03	.04	-.81	.42
	Reasoning	.11	.05	2.18	.03*

\*significant bivariate predictor

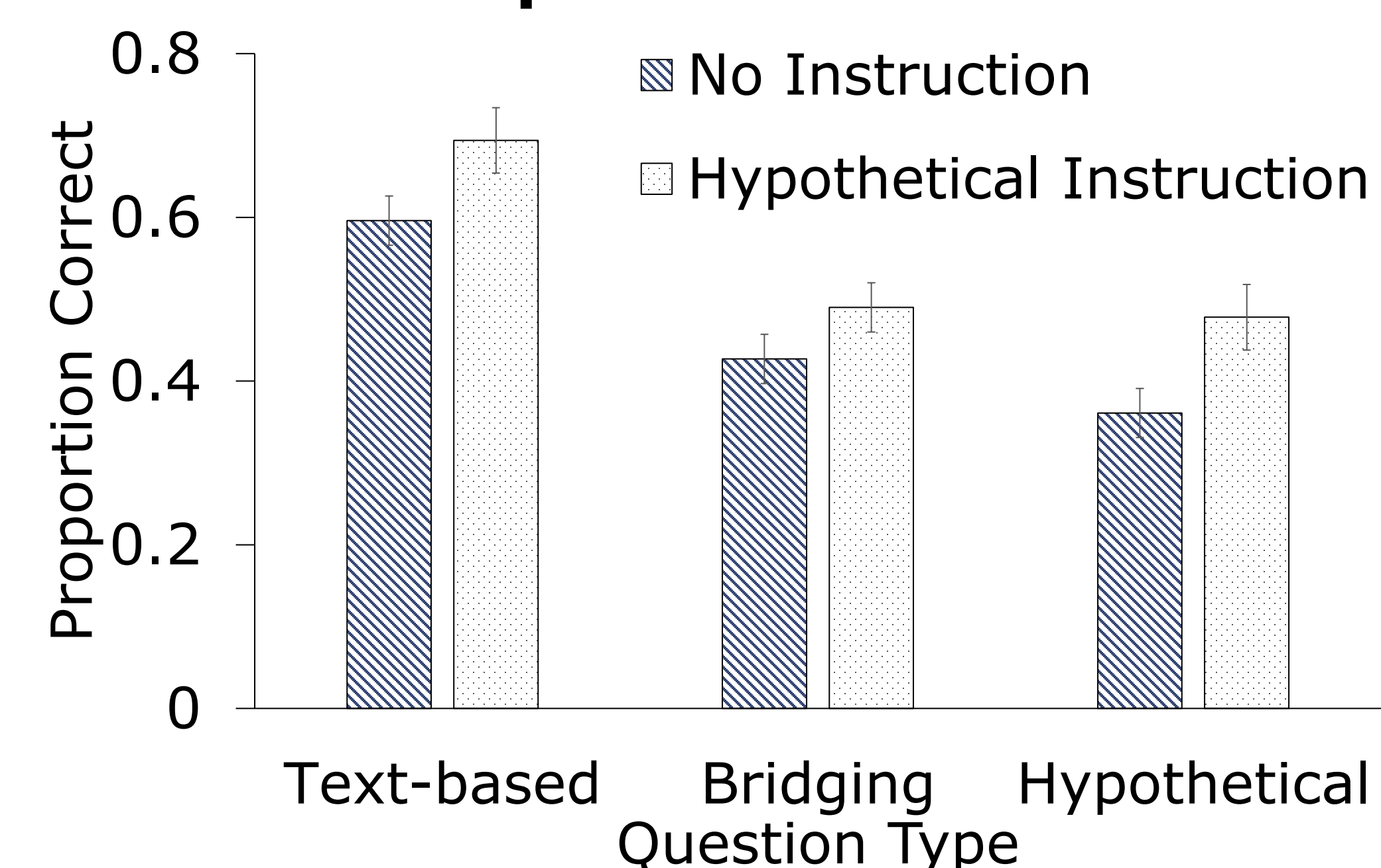
## Experiment 3

102 undergraduates

Test-expectancy prompted readers to engage in reasoning with information



**Test Expectancy for hypothetical inference questions increased test performance**



## Conclusions

Low performance on hypothetical inference questions.

- Performance predicted by reasoning.

Test expectancy may have cued readers to engage in reasoning or read at a deeper level of processing.

- Readers may not have a schema developed for how to answer hypothetical inferences questions.

Next steps are using eyetracking to understand how reading behaviors are altered during reading when readers are presented with information about what type of test questions to expect.

Given the low performance (even with the test expectancy), instructional interventions targeted at helping readers during study to identify the important elements of the textbase and the key areas where reasoning may need to occur may be necessary.

## References

- Britt, M. A., Rouet, J. F., & Durik, A. M. (2017). *Literacy beyond text comprehension: A theory of purposeful reading*. Routledge.
- Griffin, T. D., Wiley, J., & Thiede, K. W. (2019). The effects of comprehension-test expectancies on metacomprehension accuracy. *Journal of Experimental Psychology: Learning Memory and Cognition*, 45(6), 1066-1092.
- Guerrero, T. A., Griffin, T. D., & Wiley, J. (2018, November). *The limitations of retrieval practice for comprehension*. Poster presented at the 59th Annual Meeting of the Psychonomic Society, New Orleans, LA.
- McKoon, G., & Ratcliff, R. (1992). Inference during reading. *Psychological Review*, 99(3), 440-466.
- Narvaez, D., van den Broek, P., & Ruiz, A. B. (1999). The influence of reading purpose on inference generation and comprehension in reading. *Journal of Educational Psychology*, 91(3), 488-496.
- Singer, M., Harkness, D., & Stewart, S. T. (1997). Constructing inferences in expository text comprehension. *Discourse Processes*, 24(2-3), 199-228.