

# Accuracy and Changes in Metacognitive Predications in an Introductory Physics Course

Jason Morpew

Department of Educational Psychology  
University of Illinois at Urbana/Champaign

Jose Mestre

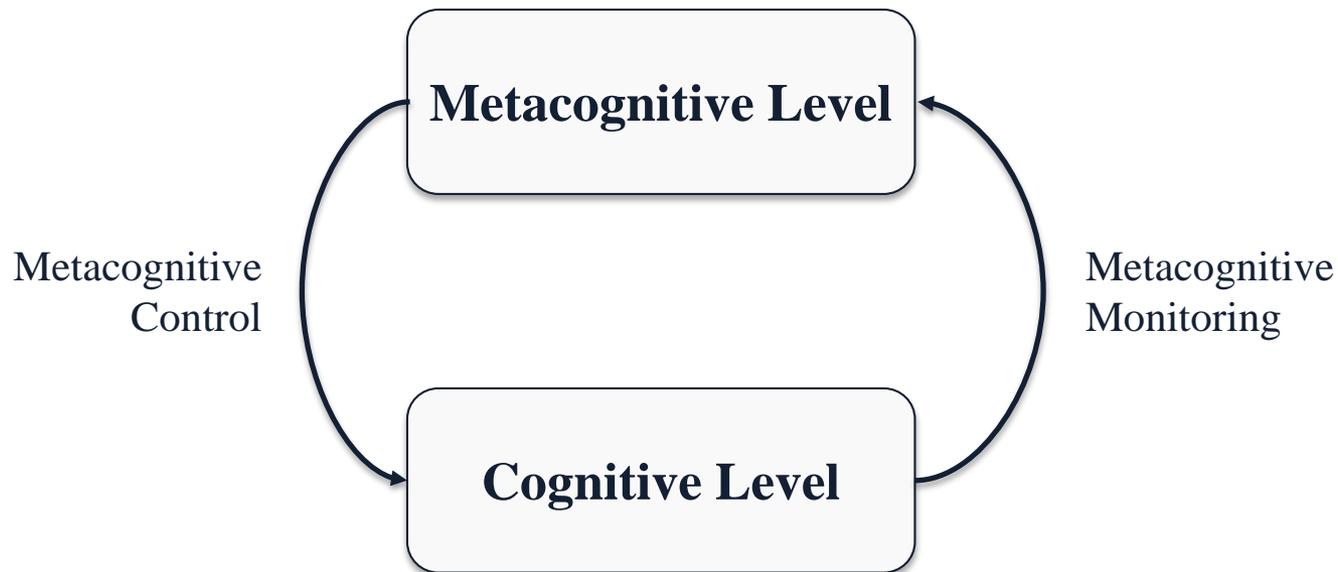
Departments of Physics and Educational Psychology  
University of Illinois at Urbana/Champaign



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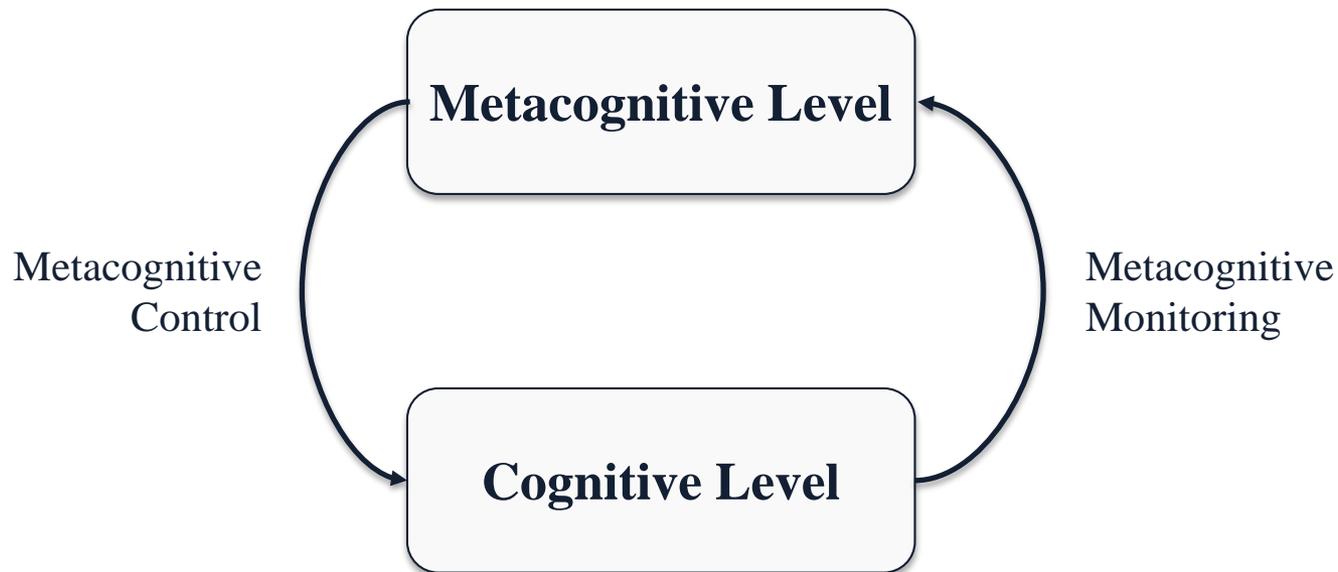
# Overview

- Metacognition is most simply defined as “thinking about thinking.” (Flavel, 1979)



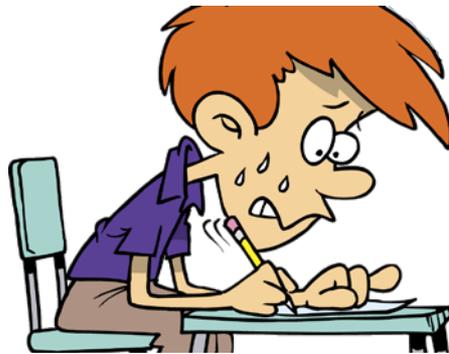
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- Success within introductory STEM courses depends on students’ accurately engaging in metacognitive monitoring.



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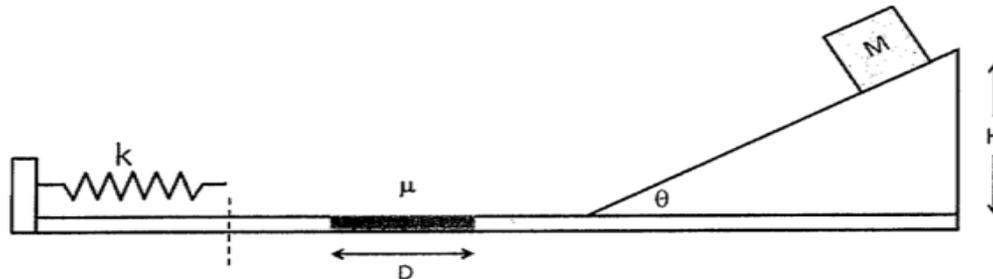
- Metacognition is most simply defined as “thinking about thinking.” (Flavel, 1979)
- Success within introductory STEM courses depends on students’ accurately engaging in metacognitive monitoring.
- Summative exams measure an individual’s metacognitive ability to determine when they have sufficiently prepared as well as their ability within the domain (Nelson, 1996)



# Metacognition and Studying

- Learners use metacognitive judgements to make decisions about studying. (Son and Kornell, 2008)
- Fluency and Familiarity are often used to make metacognitive judgements. (Reder, 1987; Koriat and Levy-Sadot, 2001; Rhodes and Castel, 2009)

5) A block of mass  $M = 0.8$  kg is released from a height  $H = 0.36$  m on a frictionless ramp making an angle  $\theta = 27^\circ$  as shown. At the bottom of the ramp the block passes through a frictional region of length  $D = 0.15$  m that has a coefficient of kinetic friction  $\mu = 0.2$ . At the end of the horizontal region is a spring having spring constant  $k = 105$  N/m.



What is the maximum compression of the spring the first time that the block comes into contact with the spring and compresses it?

# Metacognition and Ability

- Students overestimate their own performance on exams, with the overestimates being more pronounced for low-performing students (e.g., Ehrlinger, et al., 2008; Kruger & Dunning, 1999).
- However some studies have found that low performing students may be better at indicating what they don't know (Lindsey & Nagel, 2015).
- Metacognitive monitoring accuracy generally does not improve over the course of a semester (e.g., Foster, et al., 2017; Miller & Geraci, 2011).

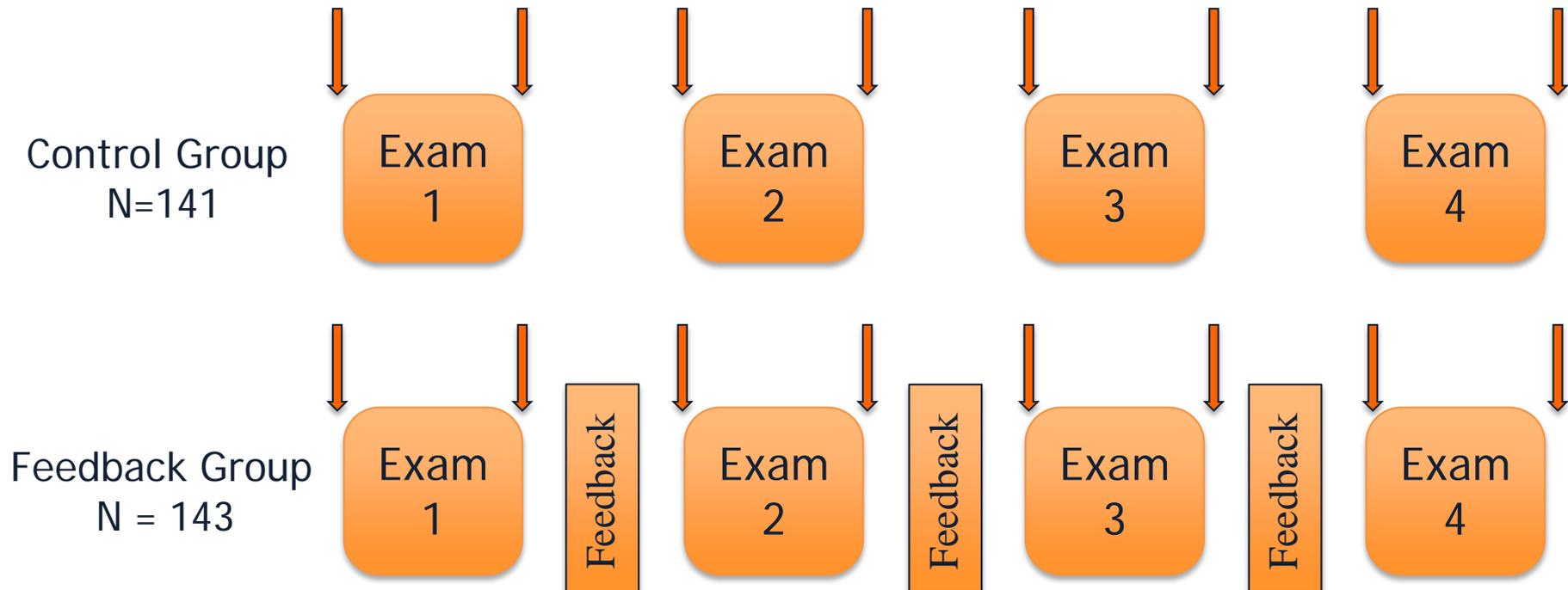
# Research Questions

- 1) What is the difference metacognitive monitoring accuracy between students of different abilities?
- 2) To what extent does an intervention where students are given feedback about the accuracy of their metacognitive predictions affect exam performance and metacognitive monitoring accuracy?

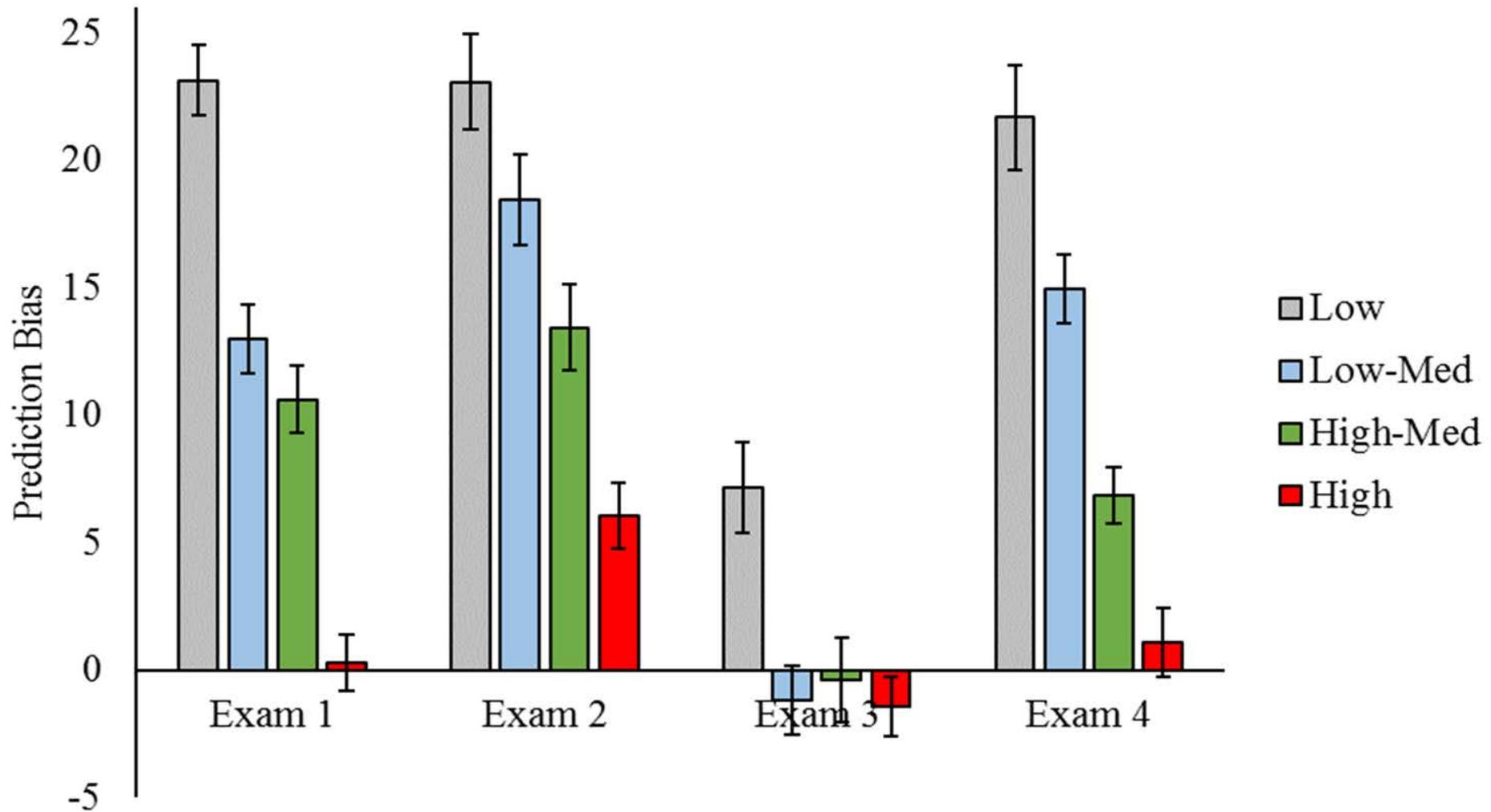
# Methods

- 284 Undergraduate students enrolled in an algebra based introductory physics course for non-majors.
  - Ability groups: Overall exam average (67-70 students in each group)

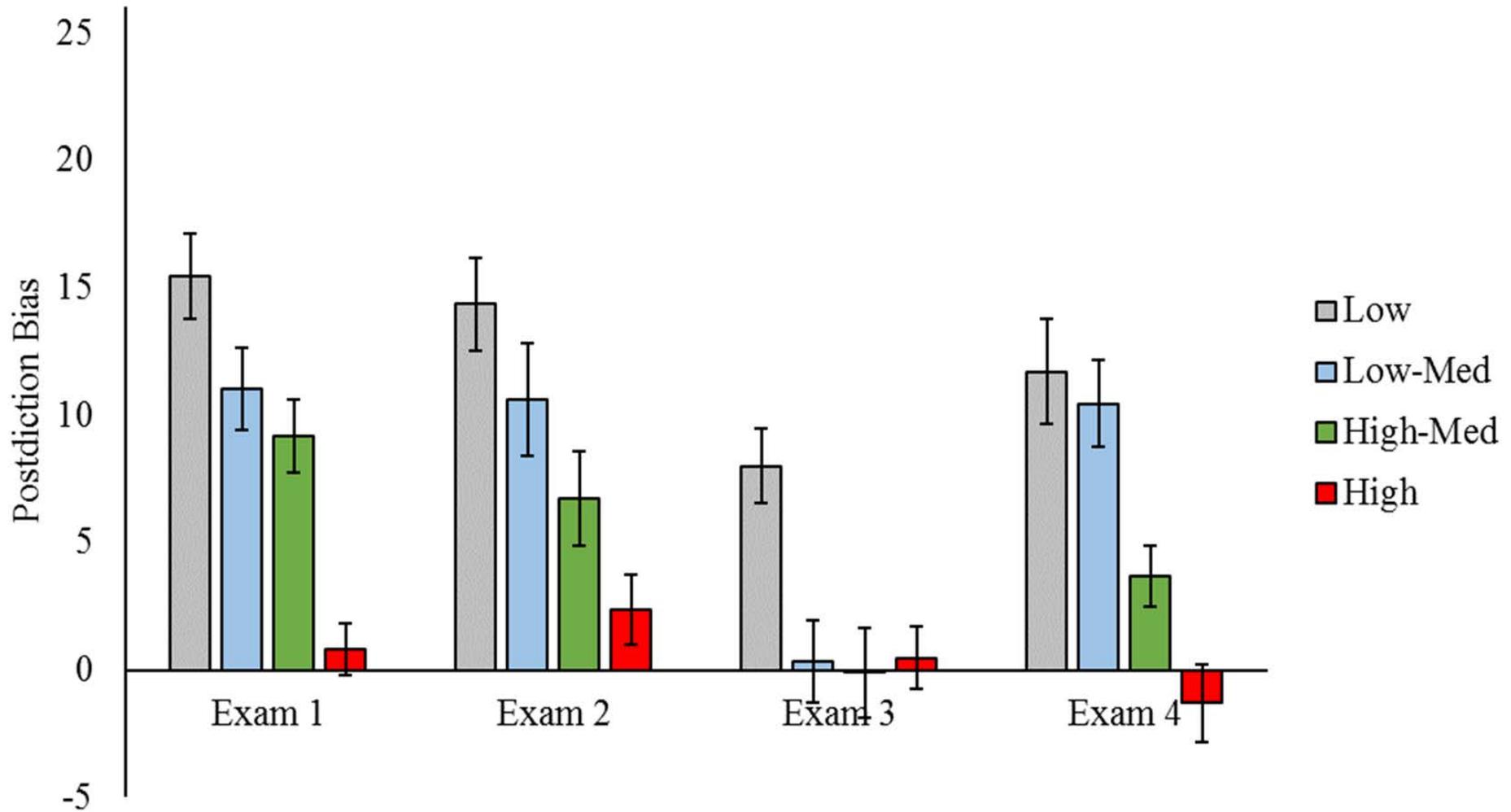
## Intervention



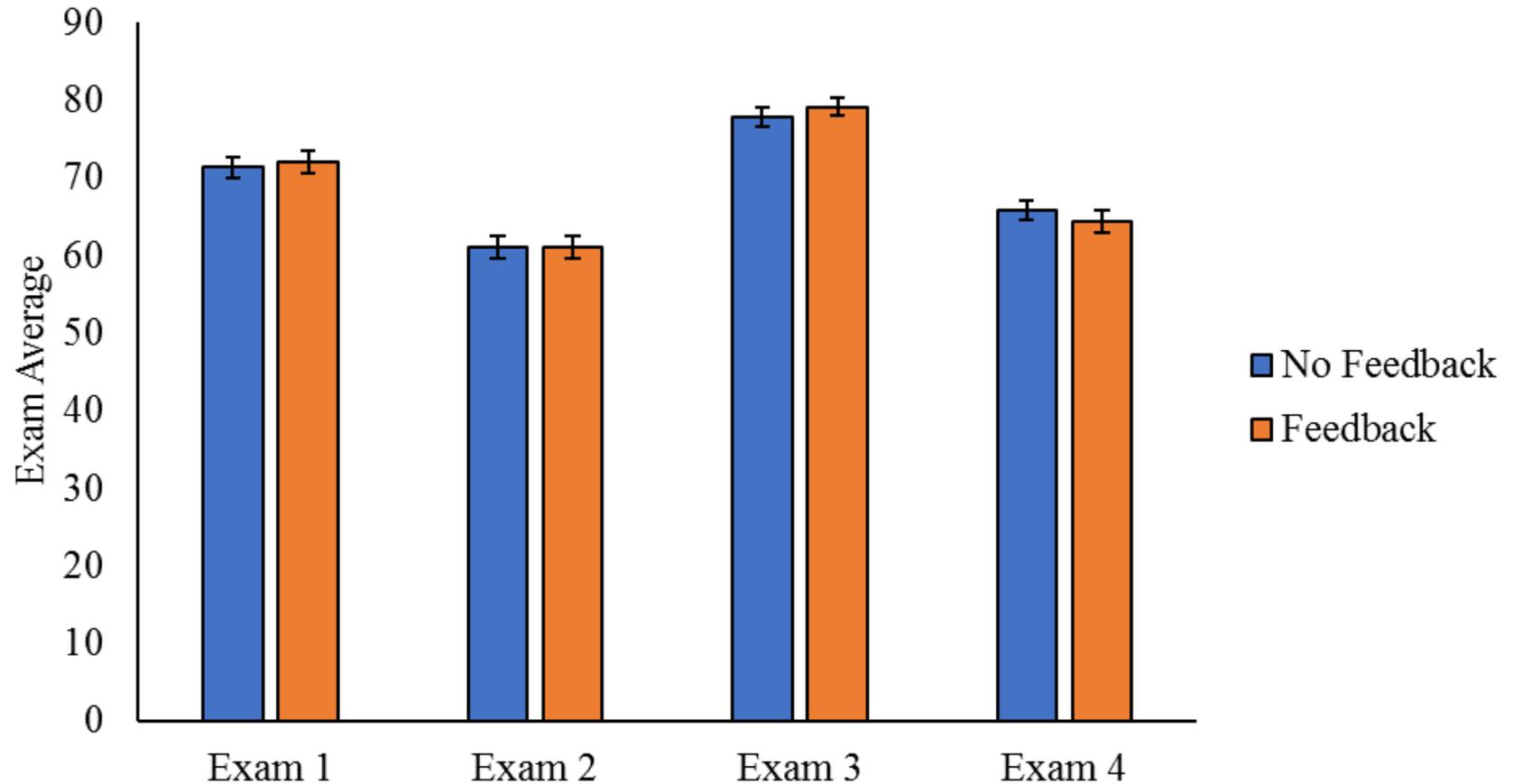
# Metacognitive Monitoring Accuracy



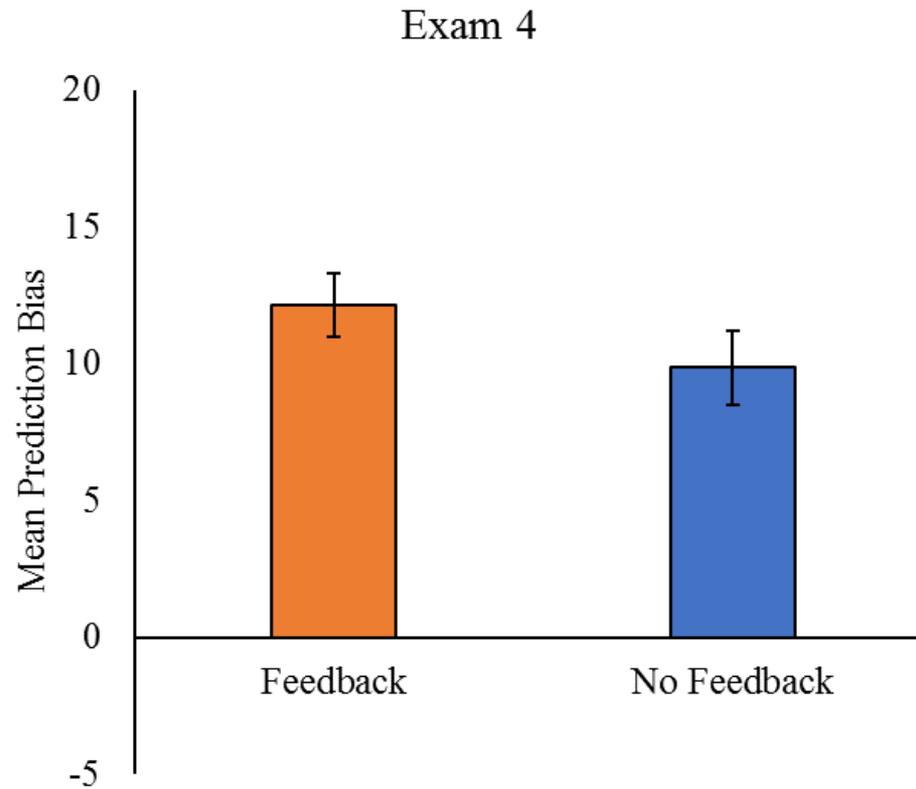
# Metacognitive Monitoring Accuracy



# Effect of Prediction Feedback

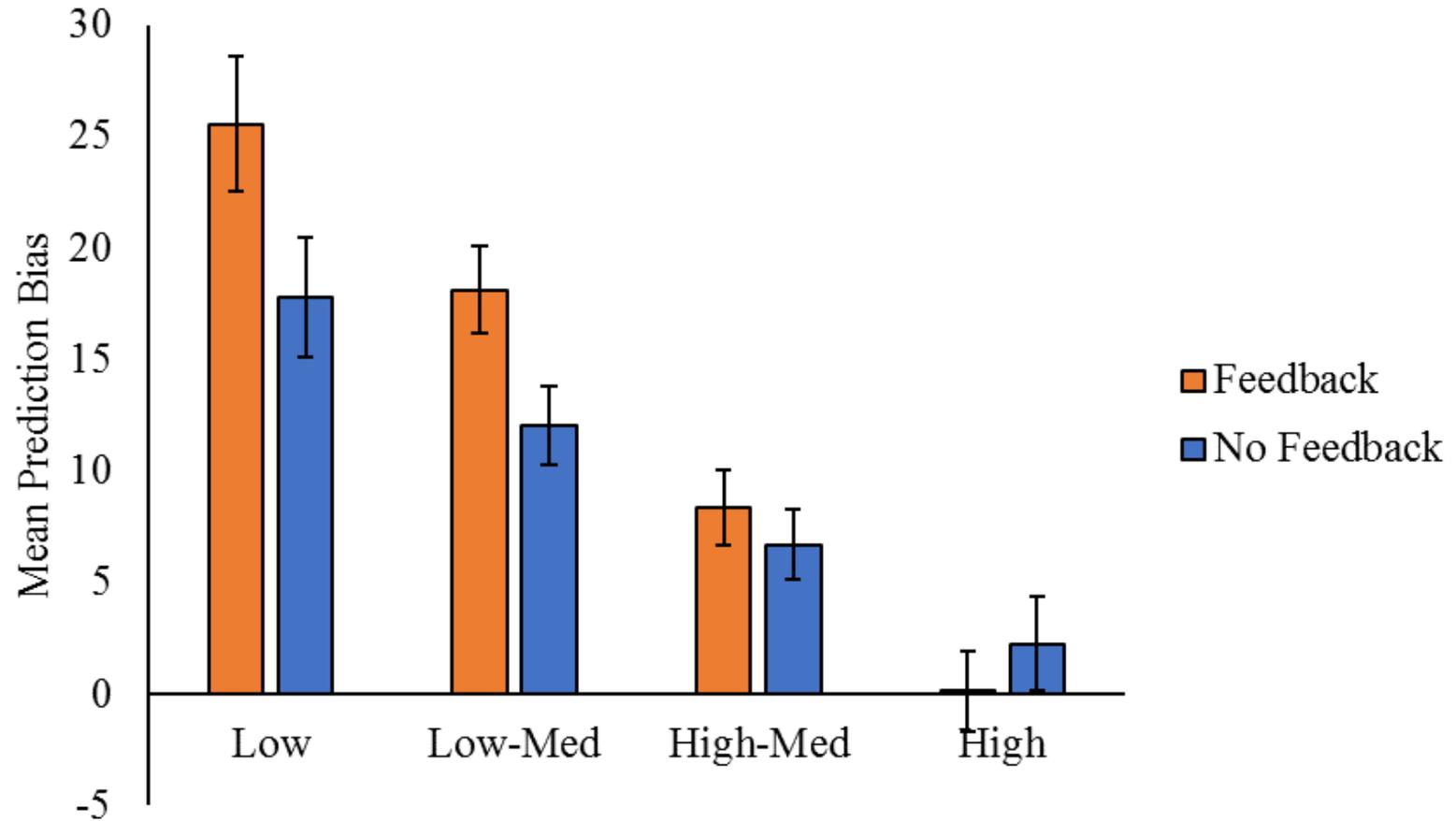


# Effect of Prediction Feedback



# Effect of Prediction Feedback

Exam 4



# Summary

- 1) What is the difference metacognitive monitoring accuracy between students of different abilities?
  - Low-performing students overpredict their exam performance by about 20 percentage points on average.
  - The overconfidence remains even after taking the exam.
  - High-performing students are more accurate.
- 2) To what extent does an intervention where students are given feedback about the accuracy of their metacognitive predictions affect exam performance and metacognitive monitoring accuracy?
  - Giving students feedback about their monitoring accuracy does not seem to help students.
  - Paradoxically low-performing students may become more overconfident after receiving feedback.

# Questions?

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Poster Session II – B59

Or visit our website:  
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Contact Information: [jmorphe2@illinois.edu](mailto:jmorphe2@illinois.edu)  
[mestre@illinois.edu](mailto:mestre@illinois.edu)



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