

# **Stereotype Threat Overview for Computing Faculty**

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University of Virginia

presentation created for Lighthouse CC

# Stereotypes (ST)

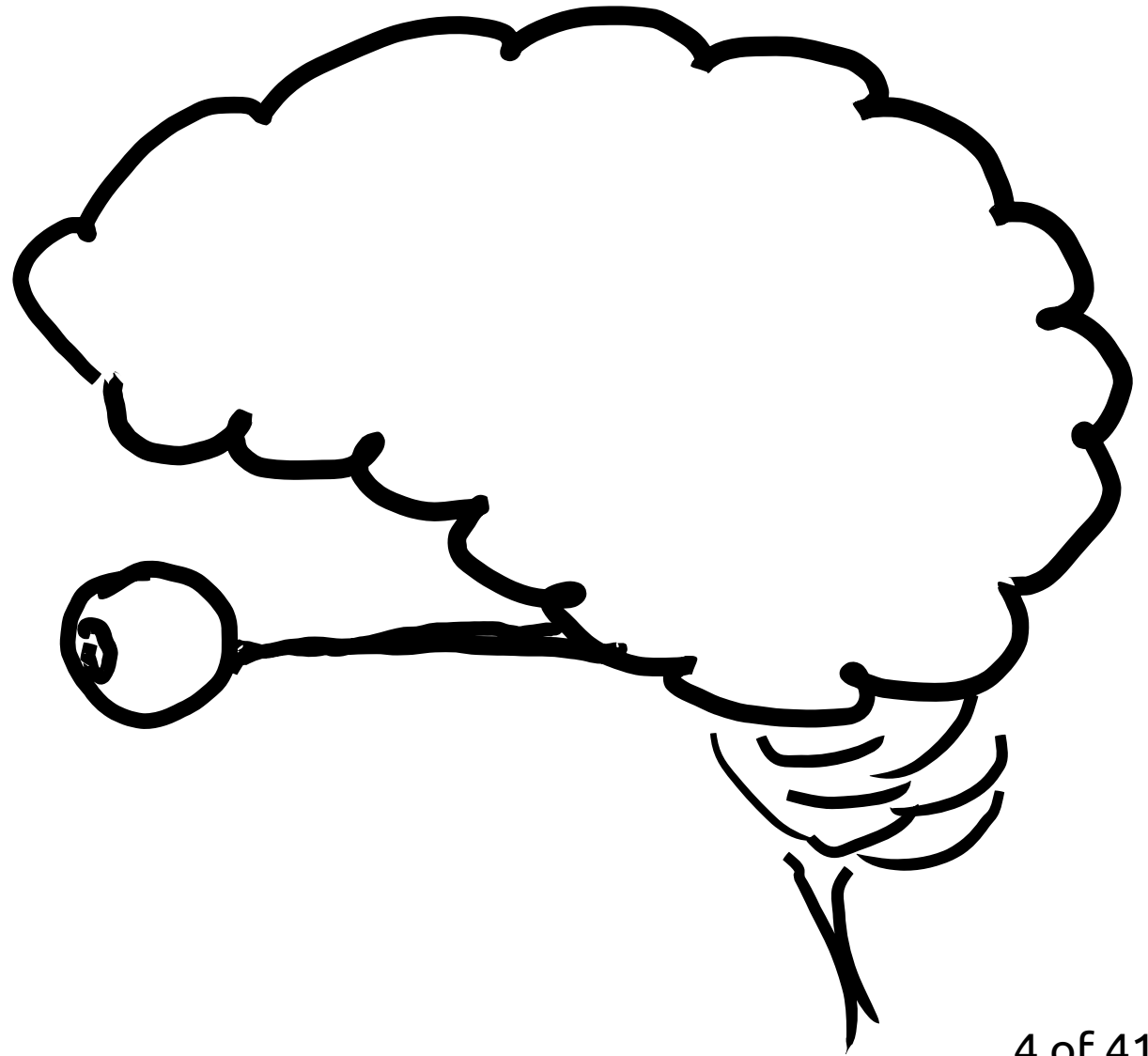
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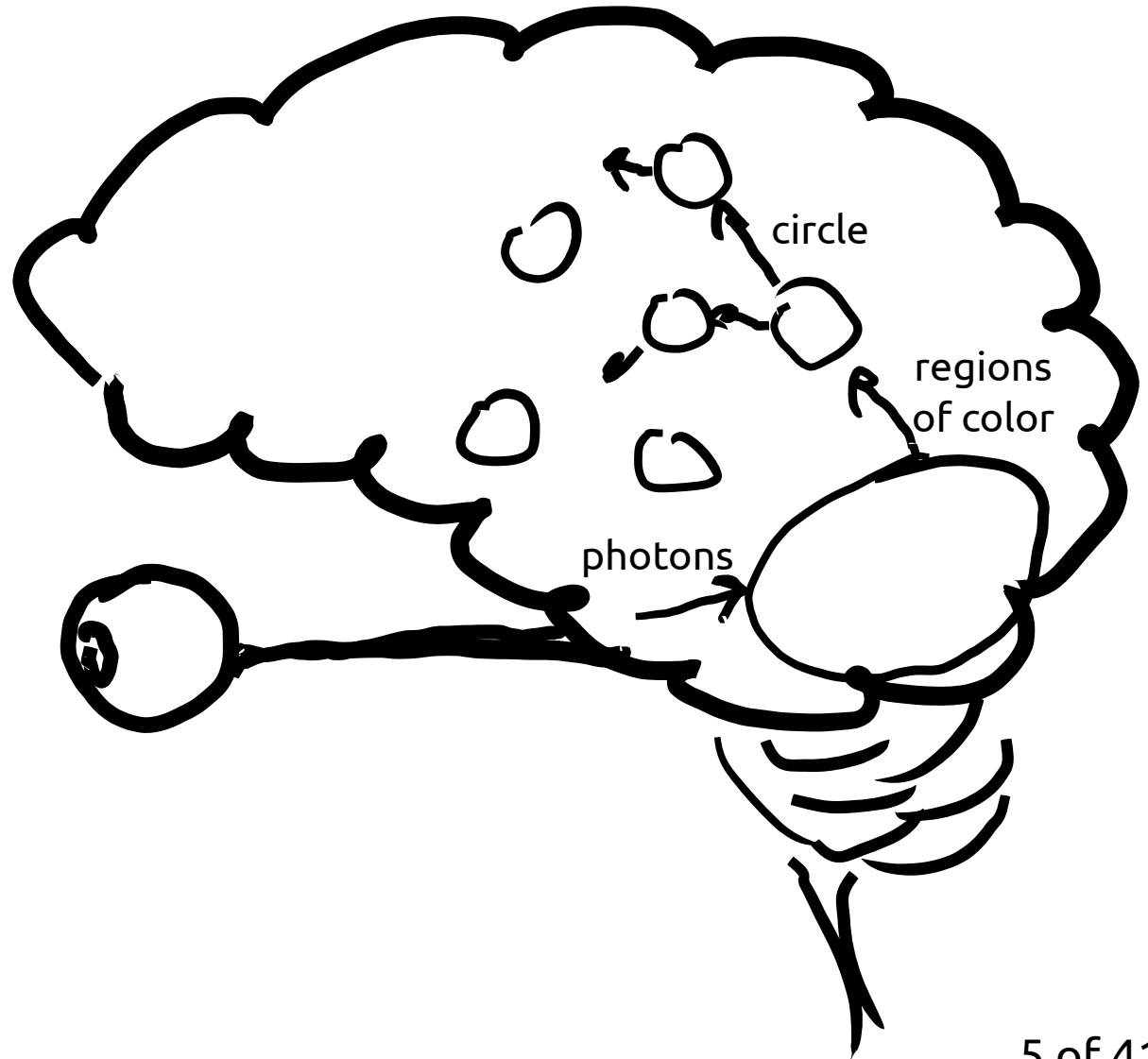
- Cause many problems, including...
  - Manifest in minds of *others*
    - Bigotry
    - Implicit bias
    - Pidgeon-hole bias
  - Manifest in mind of *student*
    - Imposter Syndrome
    - **Stereotype Threat (STT)**

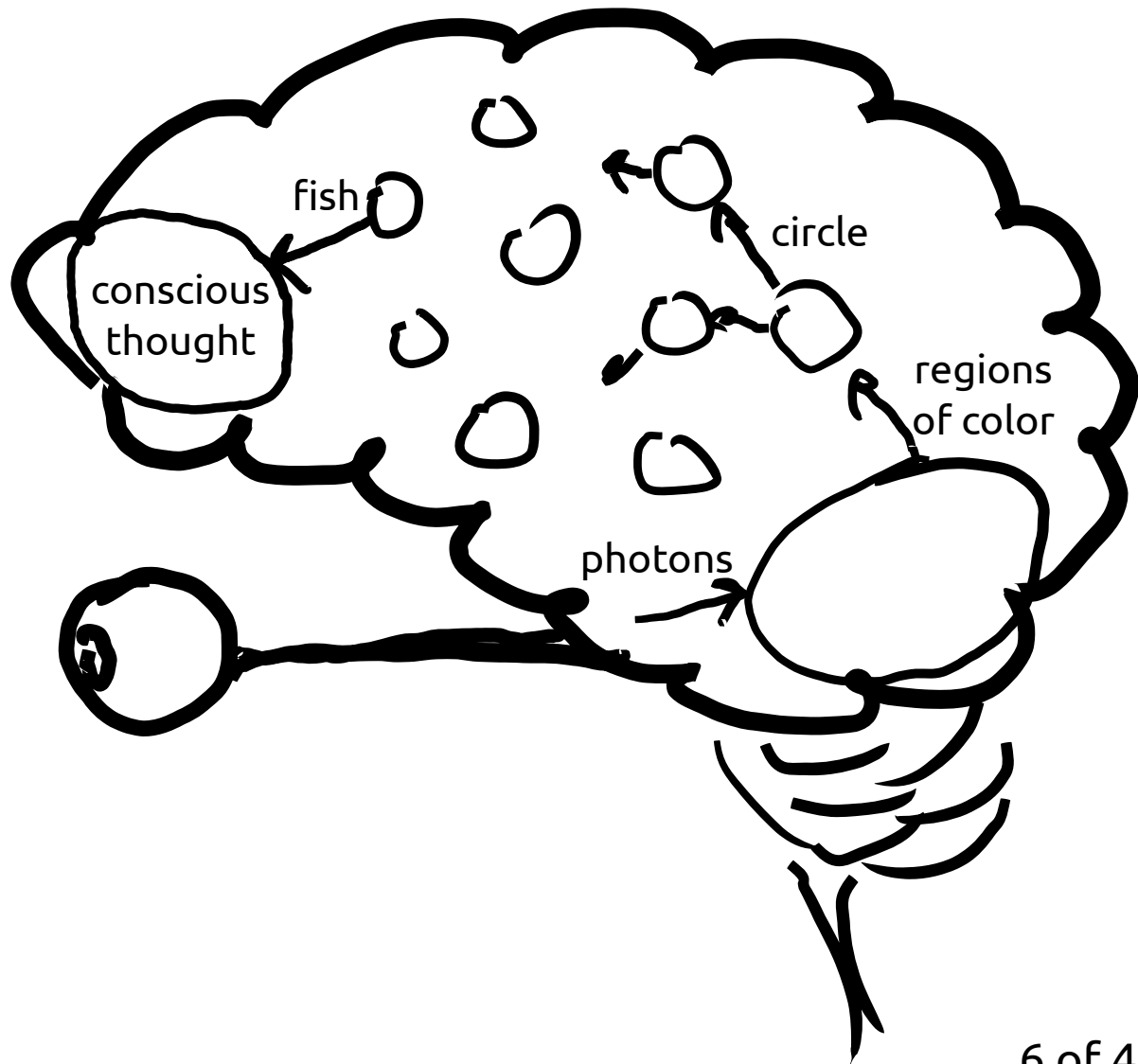
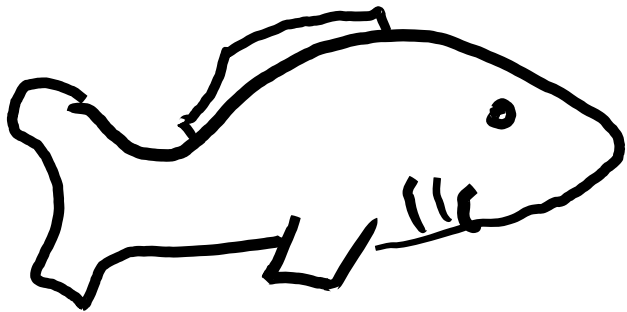
# Stereotype Threat

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- When you are
  - aware of
  - a negative stereotype
  - about people like you
- Then
  - you perform less well
  - (whether you believe the ST or not)

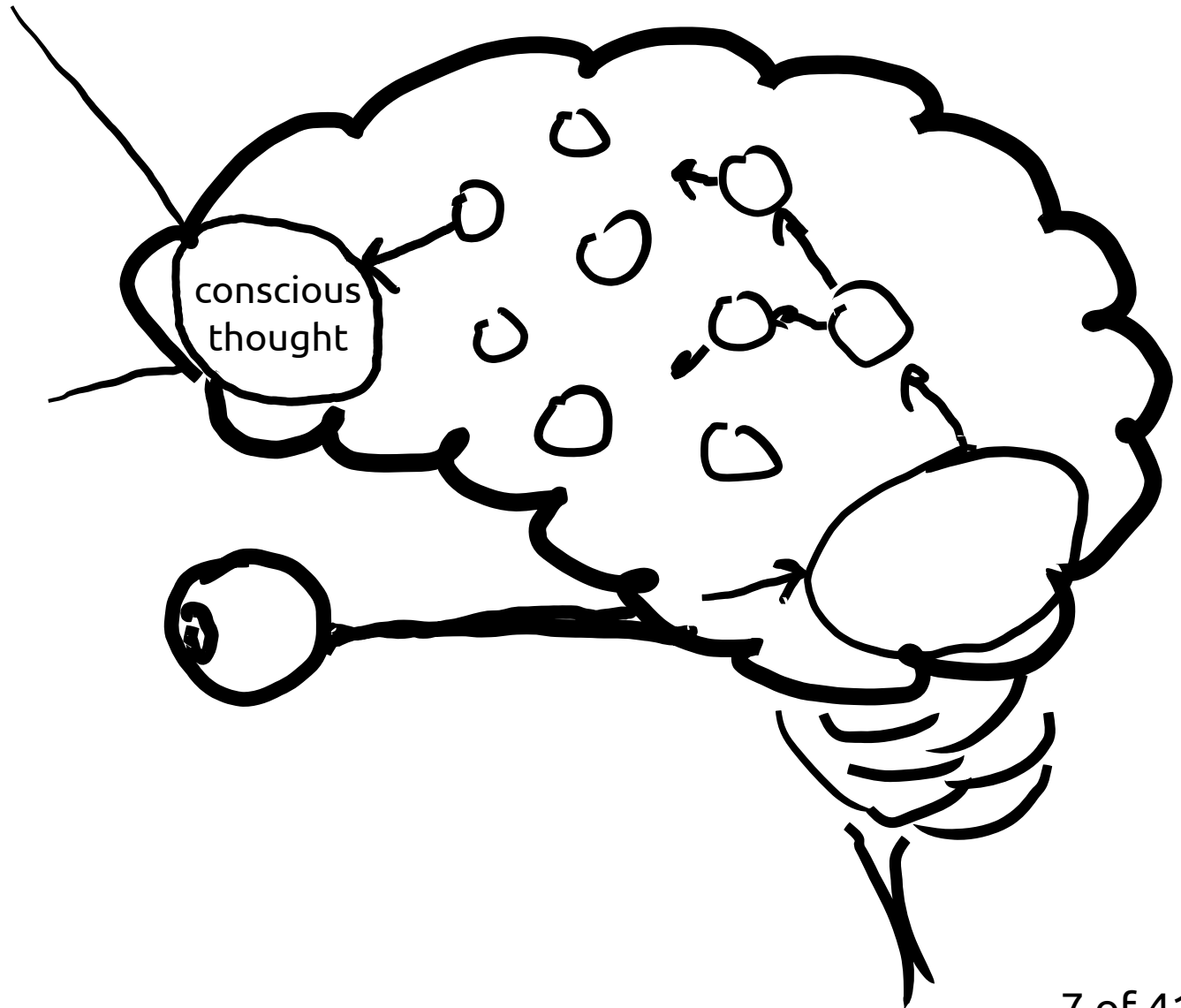




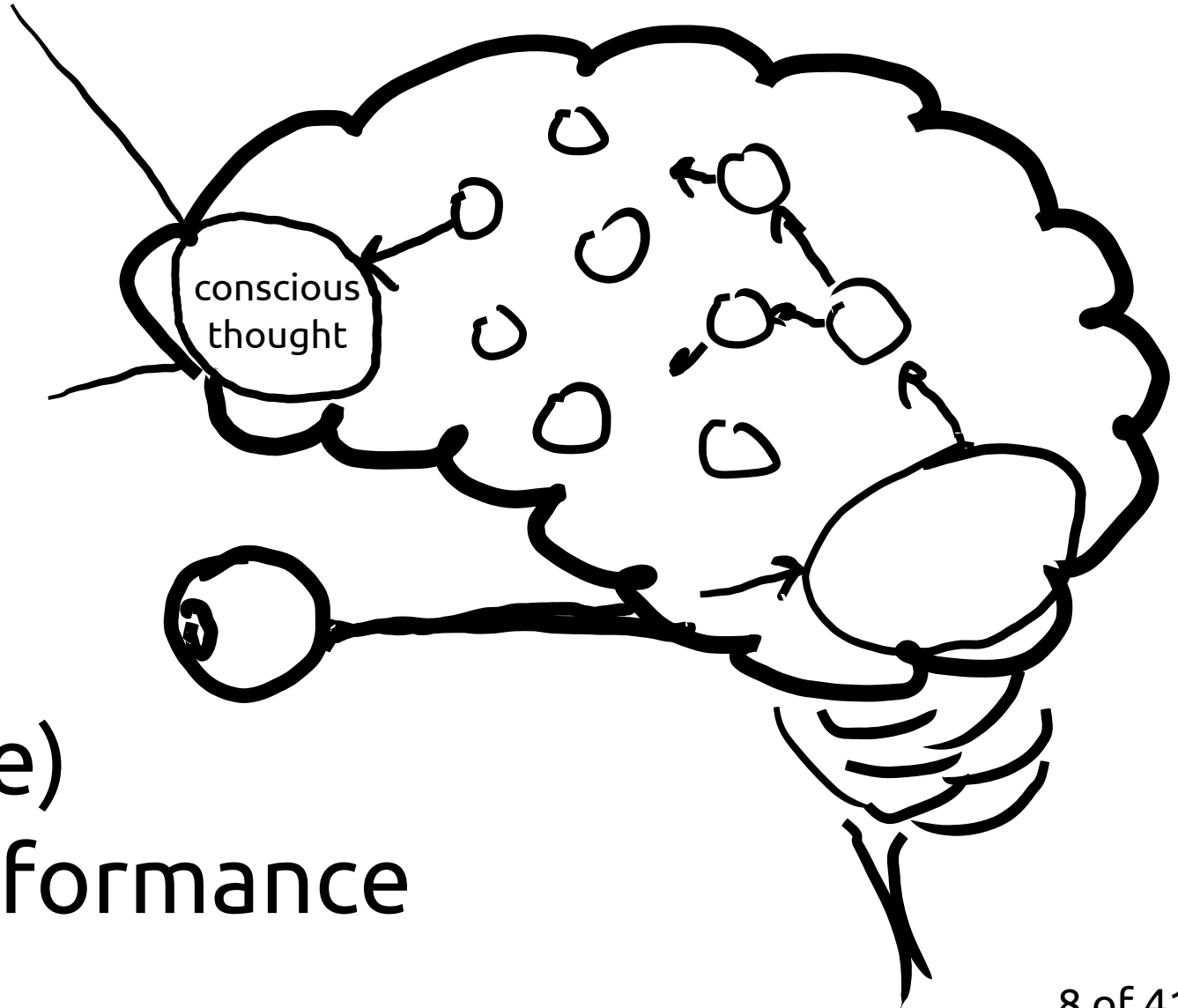


understand
understand
learn

working memory  
±3 ideas



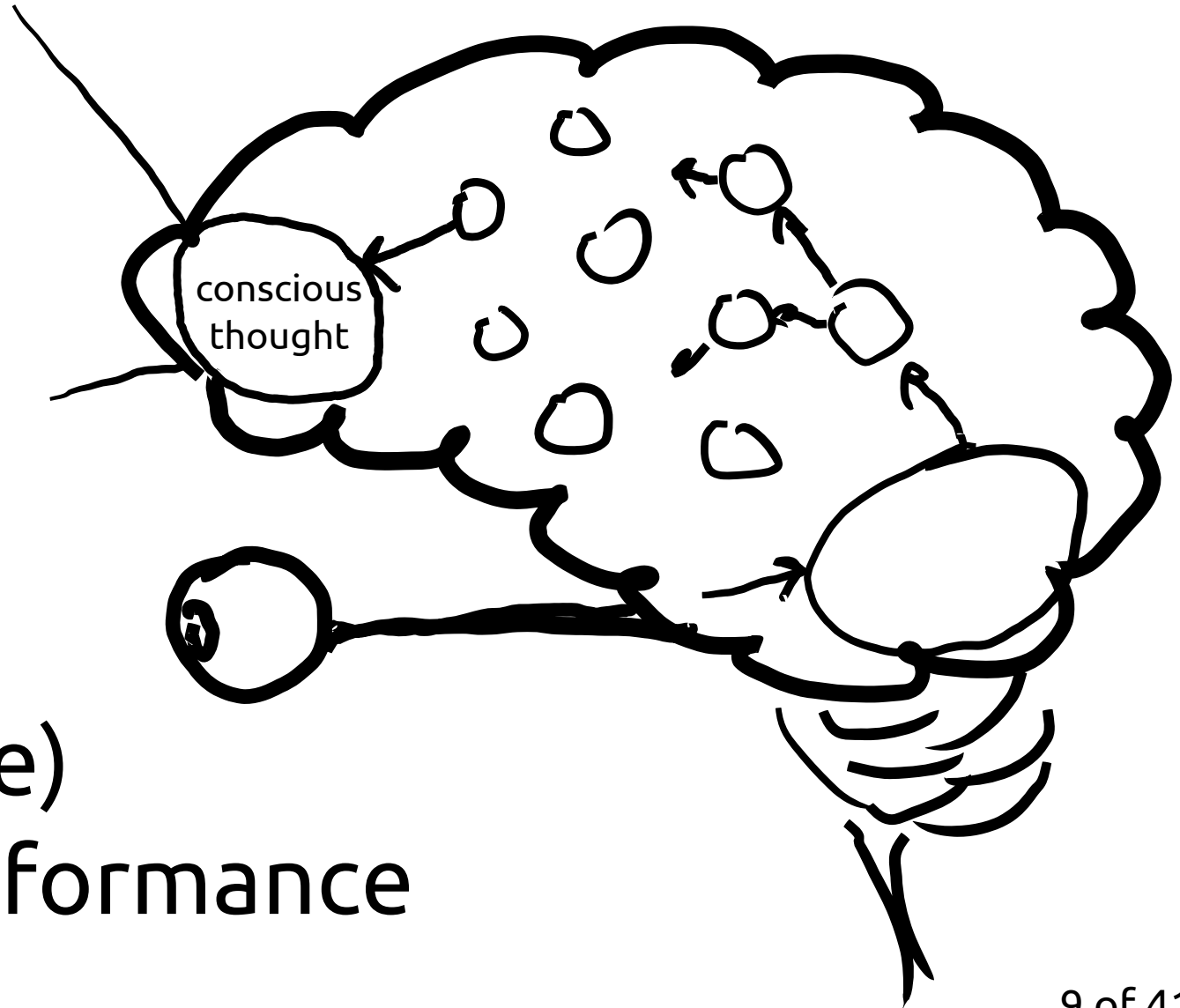
understand
understand
I'll fail because the ST is right



If believed,  
STT blocks (some)  
learning and performance



understand
understand
if I fail, they'll think the ST was right



If not believed,  
STT blocks (some)  
learning and performance

# Stereotype Threat Effects on Black and White Athletic Performance

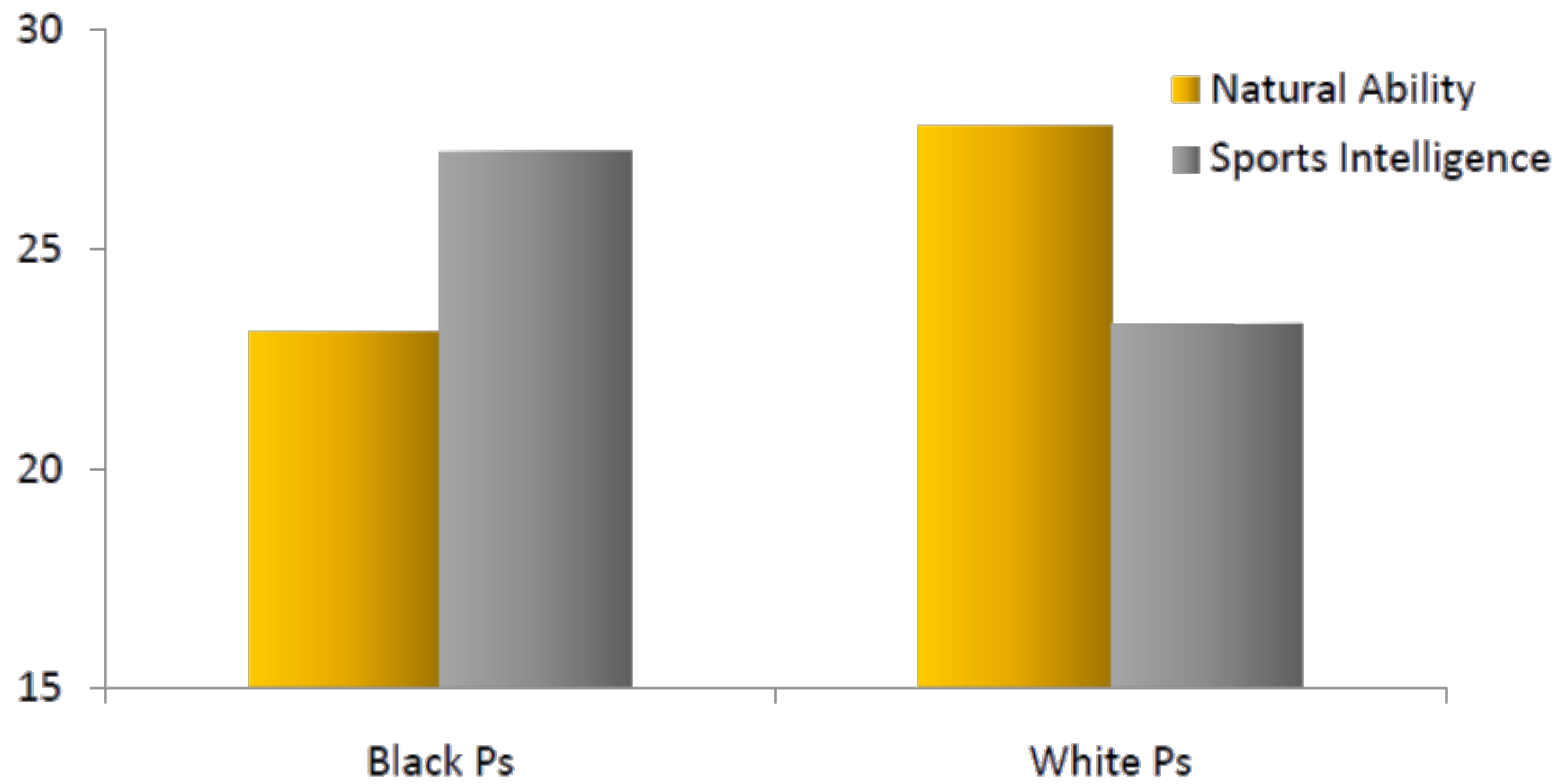
Jeff Stone  
University of Arizona

Christian I. Lynch  
Princeton University

Mike Sjomeling  
University of Arizona

John M. Darley  
Princeton University

Two experiments showed that framing an athletic task as diagnostic of negative racial stereotypes about Black or White athletes can impede their performance in sports. In Experiment 1, Black participants performed significantly worse than did control participants when performance on a golf task was framed as diagnostic of “sports intelligence.” In comparison, White participants performed worse than did control participants when the golf task was framed as diagnostic of “natural athletic ability.” Experiment 2 observed the effect of stereotype threat on the athletic performance of White participants for whom performance in sports represented a significant measure of their self-worth. The implications of the findings for the theory of stereotype threat (C. M. Steele, 1997) and for participation in sports are discussed.



# Problems in the pipeline: Stereotype threat and women's achievement in high-level math courses <sup>☆</sup>

Catherine Good <sup>a,\*</sup>, Joshua Aronson <sup>b,\*</sup>, Jayne Ann Harder <sup>c</sup>

<sup>a</sup> *Barnard College, Columbia University, United States*

<sup>b</sup> *New York University, United States*

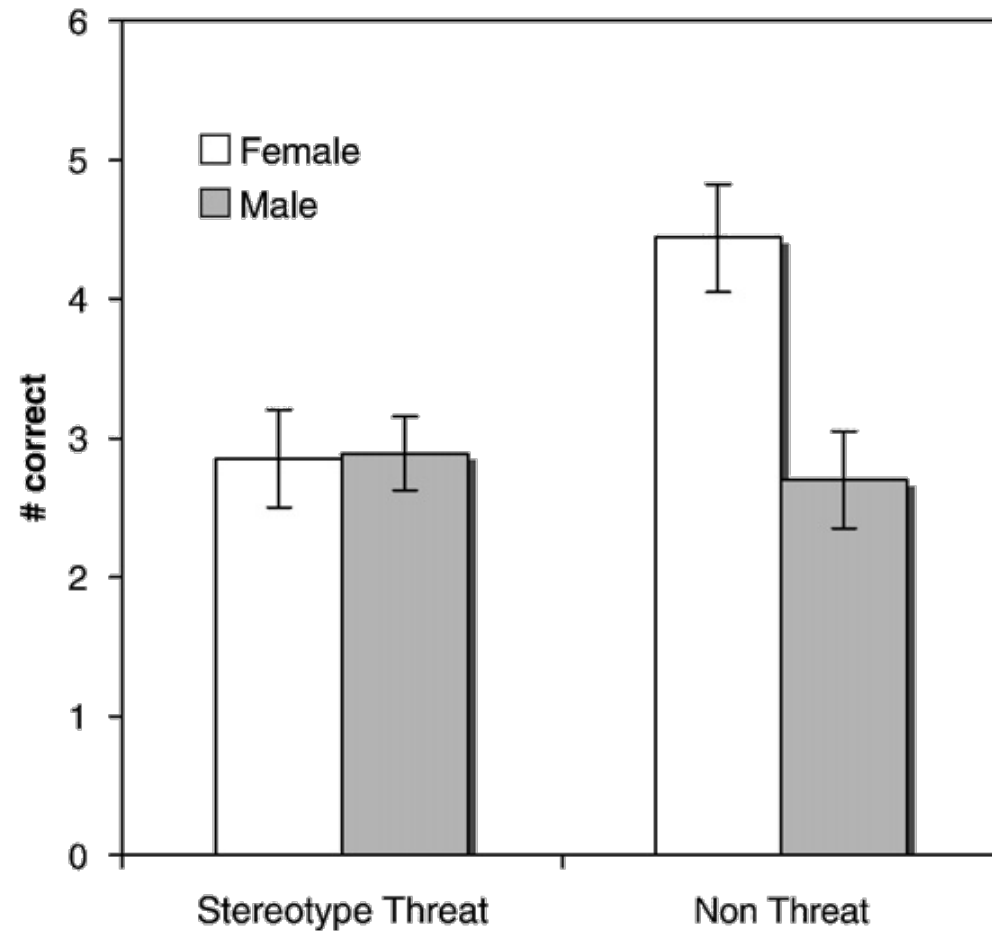
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Available online 20 November 2007

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## Abstract

It is well established that negative stereotypes can undermine women's performance on mathematics tests. Despite considerable laboratory evidence for the role of "stereotype threat" in girls' and women's math test performance, the relevance of such findings for the "real world" gender test-score gap remains unclear and debates about causes focus primarily on innate sex differences in cognitive capacity. Reported here are results of a field experiment that tested the usefulness of the stereotype threat formulation for understanding women's performance in upper levels of college mathematics — men and women who are highly motivated and proficient mathematicians and who are in the pipeline to mathematics and science professions. Our primary hypothesis was confirmed. Test performance of women in a stereotype-nullifying presentation of the test in an experimental group was raised significantly to surpass that of the men in the course. In a control group, in which test-takers were given the test under normal test



# Stereotype Threat – Summary

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- Caused when aware of negative stereotype about you
- (dis)Belief not required
- Changing awareness can change performance
  - May remove demographic impact
  - May invert impact if selection bias present

# Avoid myth-busting

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- “it is not true that  $X$  are  $Y$ ”
  - conveys “I don’t think it is true...”
  - ...but everyone else does”
  - *increases* awareness of stereotype
- “our highest scorer was  $X$ , a  $Y$ !”
  - conveys “it is remarkable when a  $Y$  succeeds”

# Countering stereotypes

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- Provide counter-stereotype evidence
  - full grade distribution shows threatened students they did well
  - discussing the contributions of atypical
- Express surprise when others raise stereotypes
  - Don't lie...people catch on
  - But don't accept ST as if expected



# Reducing “About Me”

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- Don't invalidate existing identities
  - “I don't see *X*” insults *X*s
- Help cultivate other identities
  - e.g., “computer scientist,” “student,” etc.
  - Identity comes after Interest, Confidence, and Belonging
  - (see Active Recruiting modules for more)
- see also “Mindset” later in this module

# Reducing Impact

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- Not all students are equally impacted
- Studied low-impact categories:
  - “this test is fair”
  - reduce belonging uncertainty
  - affirm personal values
  - normalize academic struggle
  - state your confidence in them
  - believe the incremental growth of intelligence

# Problems in the pipeline: Stereotype threat and women's achievement in high-level math courses <sup>☆</sup>

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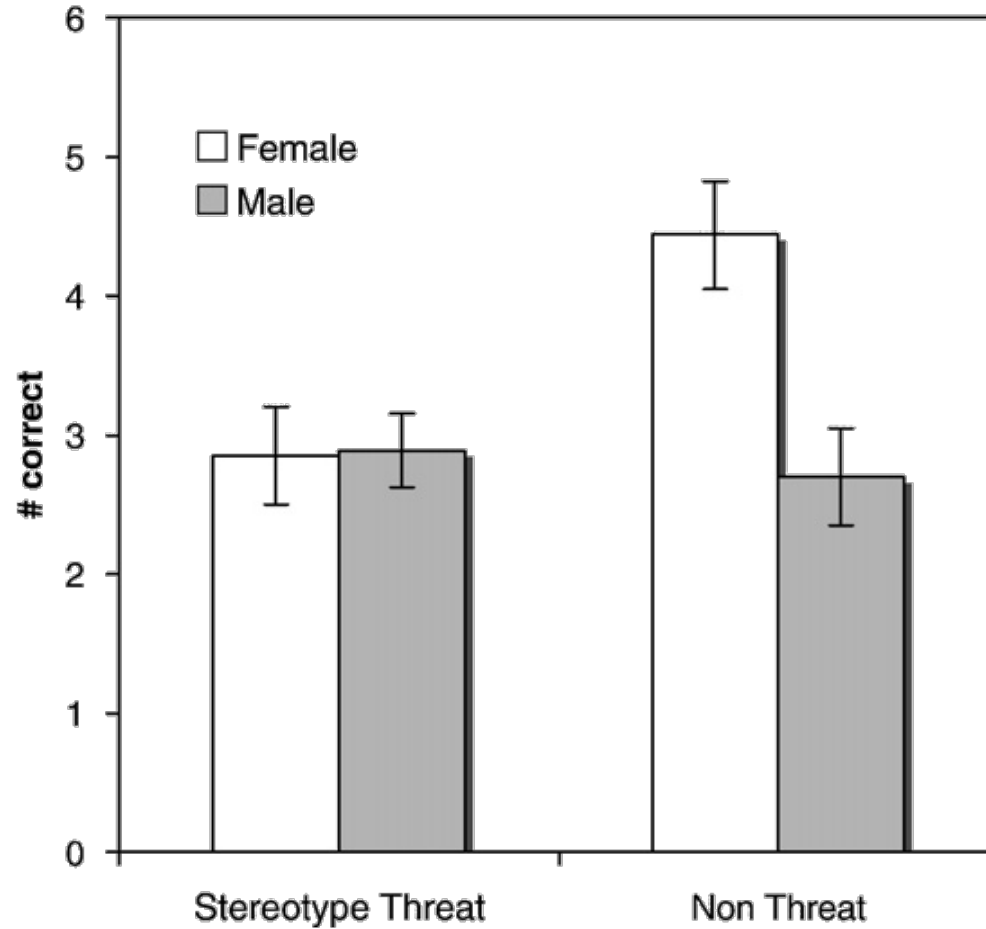
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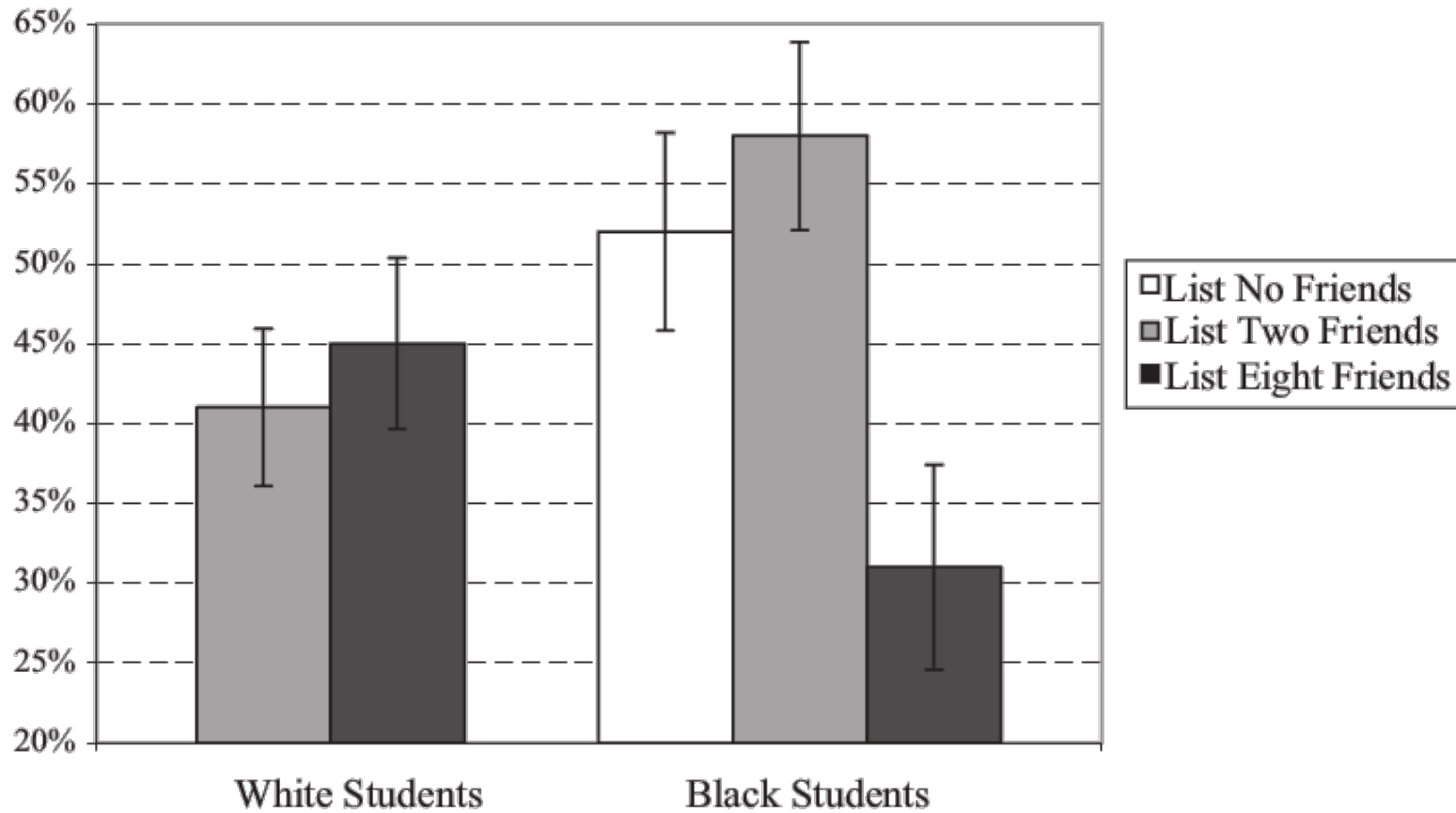
Intervention: “this test shows no gender difference in results”

# A Question of Belonging: Race, Social Fit, and Achievement

Gregory M. Walton  
Yale University

Geoffrey L. Cohen  
University of Colorado at Boulder

Stigmatization can give rise to *belonging uncertainty*. In this state, people are sensitive to information diagnostic of the quality of their social connections. Two experiments tested how belonging uncertainty undermines the motivation and achievement of people whose group is negatively characterized in academic settings. In Experiment 1, students were led to believe that they might have few friends in an intellectual domain. Whereas White students were unaffected, Black students (stigmatized in academics) displayed a drop in their sense of belonging and potential. In Experiment 2, an intervention that mitigated doubts about social belonging in college raised the academic achievement (e.g., college grades) of Black students but not of White students. Implications for theories of achievement motivation and intervention are discussed.



*Figure 1.* Experiment 1: Self-perceived potential to succeed in computer science. Means represent students' percentile estimates of their potential relative to their peers. No White students were assigned to the "list no friends" condition. Error bars represent +1/-1 standard errors.

# Belonging

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- Belonging in group is good...
- Lack of context about how many friends normal
  - Asking to list friends increases this stress
- Telling them “everyone struggles to make friends” gives that context

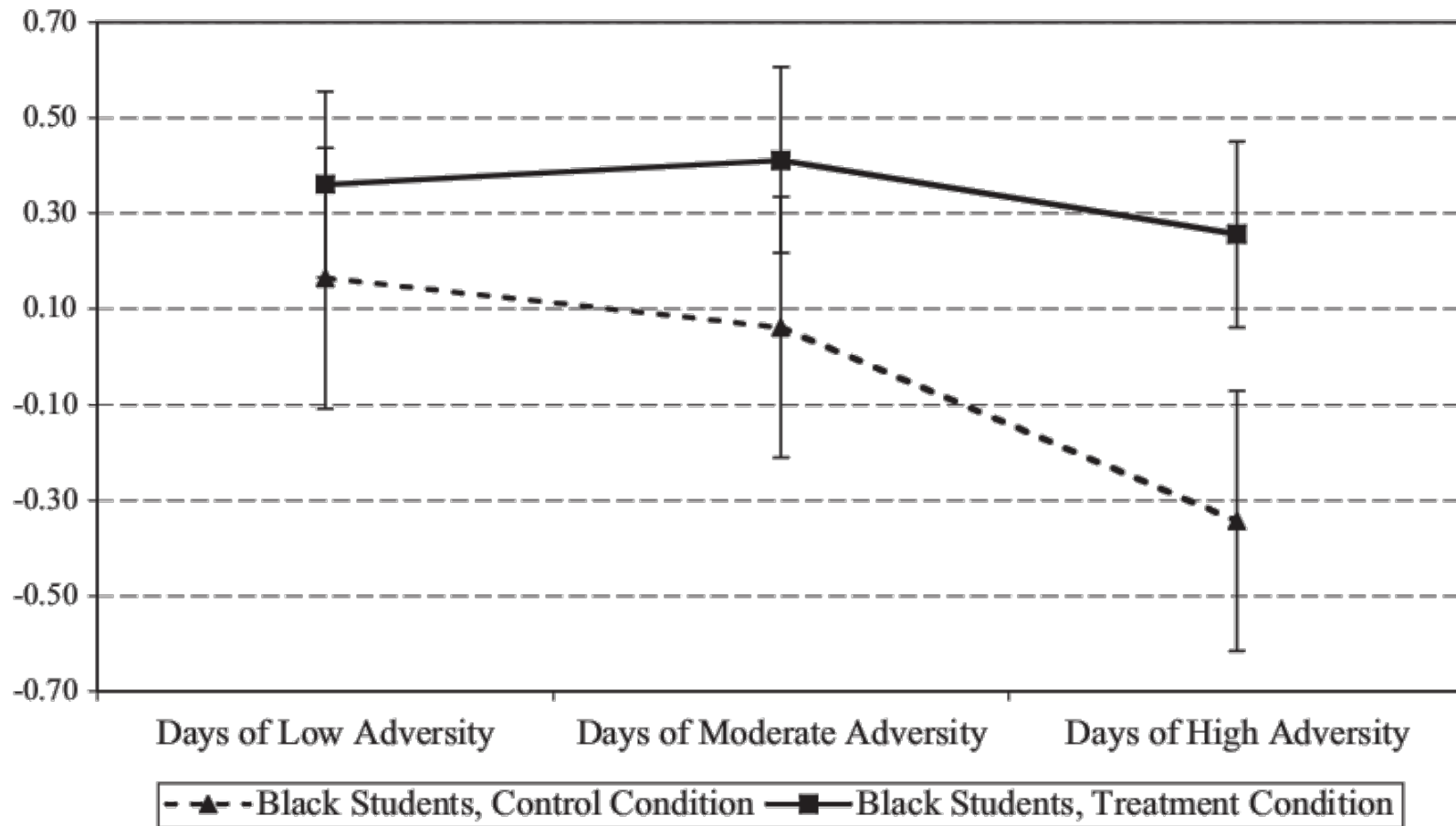


Figure 3. Experiment 2: Black students' sense of academic fit on days of low, moderate, and high adversity. Error bars represent + 1/-1 standard errors.



# Reducing the Gender Achievement Gap in College Science: A Classroom Study of Values Affirmation

Akira Miyake,<sup>1\*</sup> Lauren E. Kost-Smith,<sup>2</sup> Noah D. Finkelstein,<sup>2</sup> Steven J. Pollock,<sup>2</sup> Geoffrey L. Cohen,<sup>3</sup> Tiffany A. Ito<sup>1</sup>

In many science, technology, engineering, and mathematics disciplines, women are outperformed by men in test scores, jeopardizing their success in science-oriented courses and careers. The current study tested the effectiveness of a psychological intervention, called values affirmation, in reducing the gender achievement gap in a college-level introductory physics class. In this randomized double-blind study, 399 students either wrote about their most important values or not, twice at the beginning of the 15-week course. Values affirmation reduced the male-female performance and learning difference substantially and elevated women's modal grades from the C to B range. Benefits were strongest for women who tended to endorse the stereotype that men do better than women in physics. A brief psychological intervention may be a promising way to address the gender gap in science performance and learning.

**T**he substantial underrepresentation of women in science, technology, engineering, and mathematics (STEM) disciplines has long

concerned policy-makers and the educational community (1, 2). In 2006, women earned only 28% of Ph.D.s in physical sciences, 25% in mathematics

and computer science, and 20% in engineering in the United States (3). Although women made up 47% of the North American workforce in 2009, the percentage of women in lucrative technical professions, such as “computer and mathematical occupations” and “architecture and engineering occupations,” reached only 25% and 14%, respectively (4). Similar underrepresentation of women in STEM-related professions is also evident in other parts of the world (5).

The gender gap in STEM disciplines goes beyond the limited representation of women. In college physics—the field studied in the present investigation—women earn lower exam grades and lower scores on standardized tests of conceptual mastery (6, 7). Students’ prior background and preparation in mathematics and physics, iden-

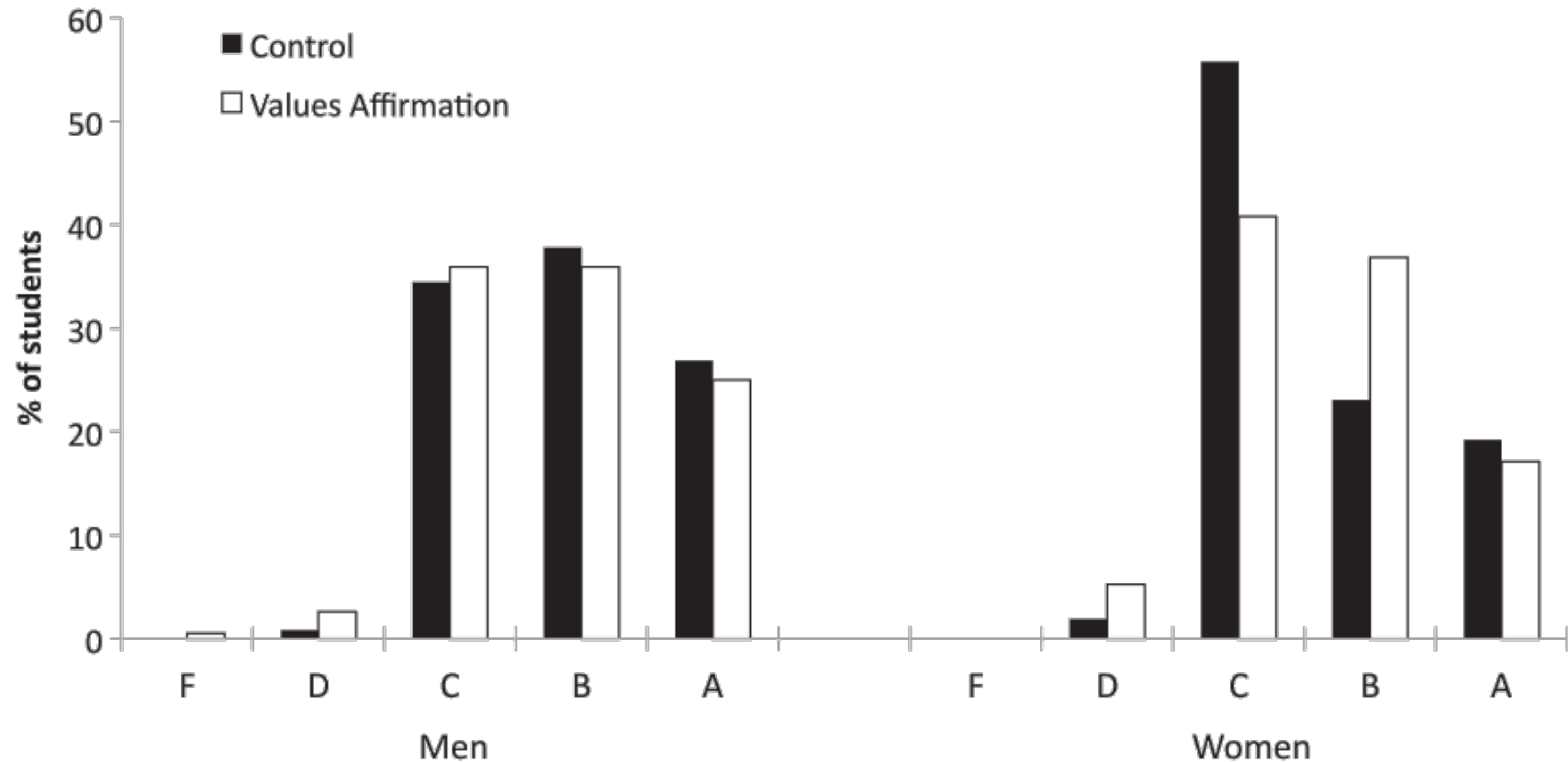
<sup>1</sup>Department of Psychology and Neuroscience, University of Colorado at Boulder, Boulder, CO, USA. <sup>2</sup>Department of Physics, University of Colorado at Boulder, Boulder, CO, USA. <sup>3</sup>School of Education, Department of Psychology, and Graduate School of Business, Stanford University, Palo Alto, CA, USA.

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# Values Affirmation

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- Study
  - give list of values (family, friends, etc)
  - control: pick least important to you
  - intervention: pick most important to you
  - both write why they picked it
- (idea: focus on self as distinct from group)
- measure performance *months* later



**Fig. 2.** Percentage of students receiving each letter grade (A, B, C, D, and F, combining letter grades with pluses and minuses) as a function of gender (men versus women) and affirmation condition (values affirmation versus control). The percentage was calculated separately for each values-affirmation condition within each gender.

# The Mentor's Dilemma: Providing Critical Feedback Across the Racial Divide

Geoffrey L. Cohen  
Claude M. Steele  
Lee D. Ross  
*Stanford University*

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*Two studies examined the response of Black and White students to critical feedback presented either alone or buffered with additional information to ameliorate its negative effects. Black students who received unbuffered critical feedback responded less favorably than White students both in ratings of the evaluator's bias and in measures of task motivation. By contrast, when the feedback was accompanied both by an invocation of high standards and by an assurance of the student's capacity to reach those standards, Black students responded as positively as White students and both groups reported enhanced identification with relevant skills and careers. This "wise," two-faceted intervention proved more effective than buffering criticism either with performance praise (Study 1) or with an invocation of high standards alone (Study 2). The role of stigma in mediating responses to critical feedback and the implications of our results*

Critical feedback, accordingly, may be especially threatening to these students because instead of merely offering information about areas in need of improvement, it raises the prospect that they have been judged in light of a negative stereotype. This "attributional ambiguity" constitutes a double-edged sword (Crocker & Major, 1989; Crocker, Voelkl, Testa, & Major, 1991). Although it may protect students' self-esteem by allowing them to attribute negative feedback to racial bias rather than shortcomings in their own performance, it also may lead them to dismiss rather than act on potentially useful criticism—especially when the criticism comes from a White evaluator rather than a Black one (Banks, Stitt, Curtis, & McQuarter, 1977; Crocker & Major, 1989; Crocker et al., 1991; see also Klock, 1966).

# Providing Criticism

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- List what did wrong, preceded by:
  - positive buffer: “you did well”
  - high standards: “we expect a lot”
  - assurance: “we know you can”
- High standards & Assurance = “Wise feedback”

# Wise feedback: Motivation

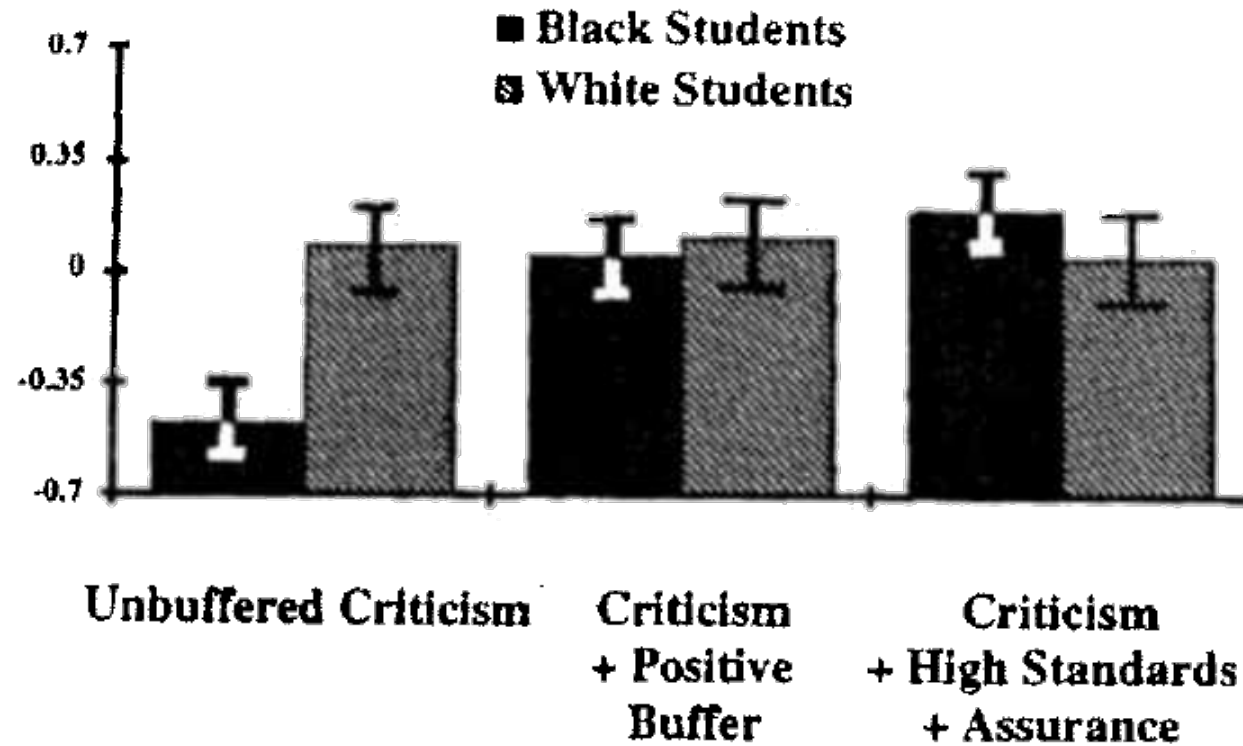


Figure 2 Task motivation as a function of race and feedback condition in Study 1.

# Wise feedback: Perceived Bias

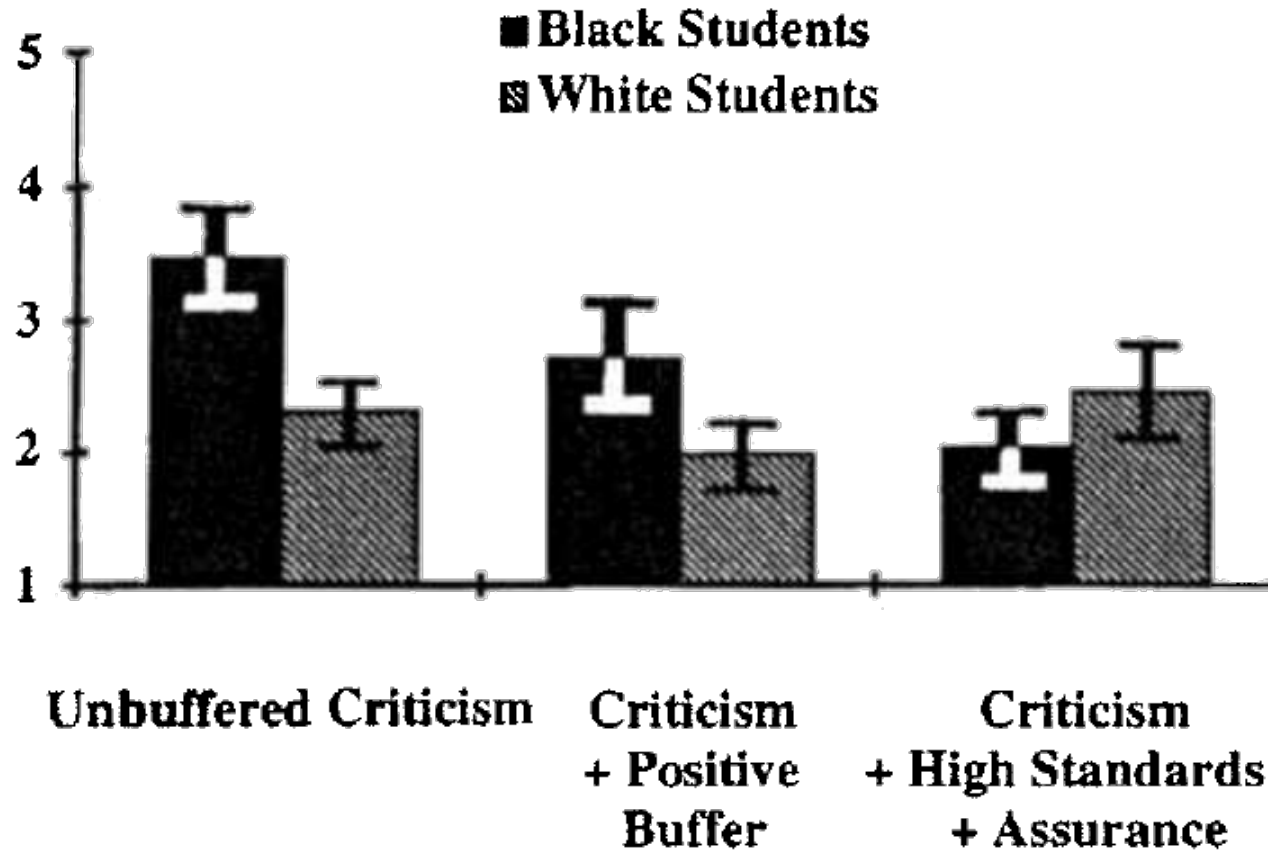


Figure 1 Ratings of bias as a function of race and feedback condition in Study 1.

# Wise feedback: Identity

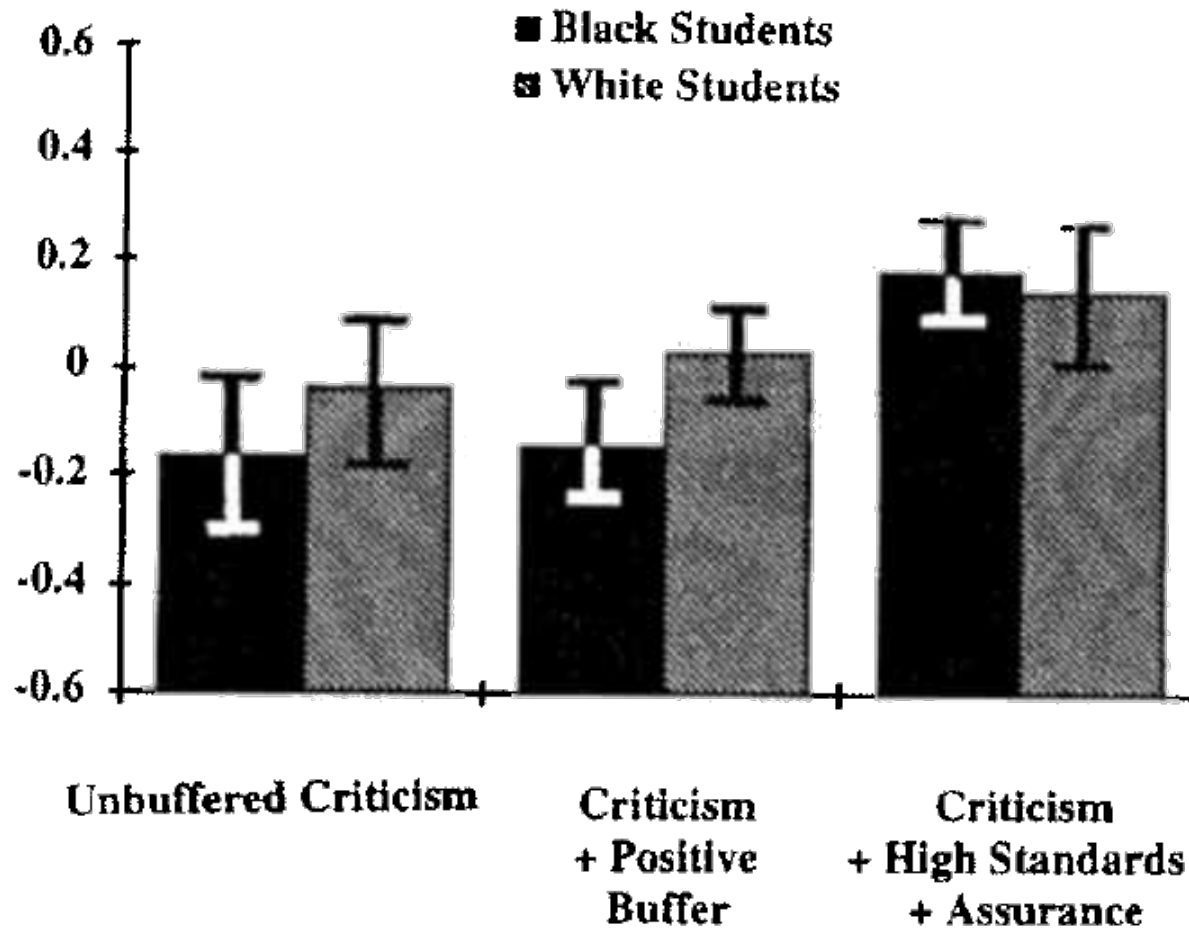


Figure 3 Identification with writing skills as a function of race and feedback condition in Study 1.



# Growth Mindset

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- Most tasks require some mix of
  - innate talent
  - developed ability
- The belief that your current tasks are
  - mostly innate talent..... **Fixed Mindset**
  - mostly developed ability .... **Growth Mindset**
- Belief itself has impact

# Improving adolescents' standardized test performance: An intervention to reduce the effects of stereotype threat

Catherine Good<sup>a,\*</sup>, Joshua Aronson<sup>b,1</sup>, Michael Inzlicht<sup>b</sup>

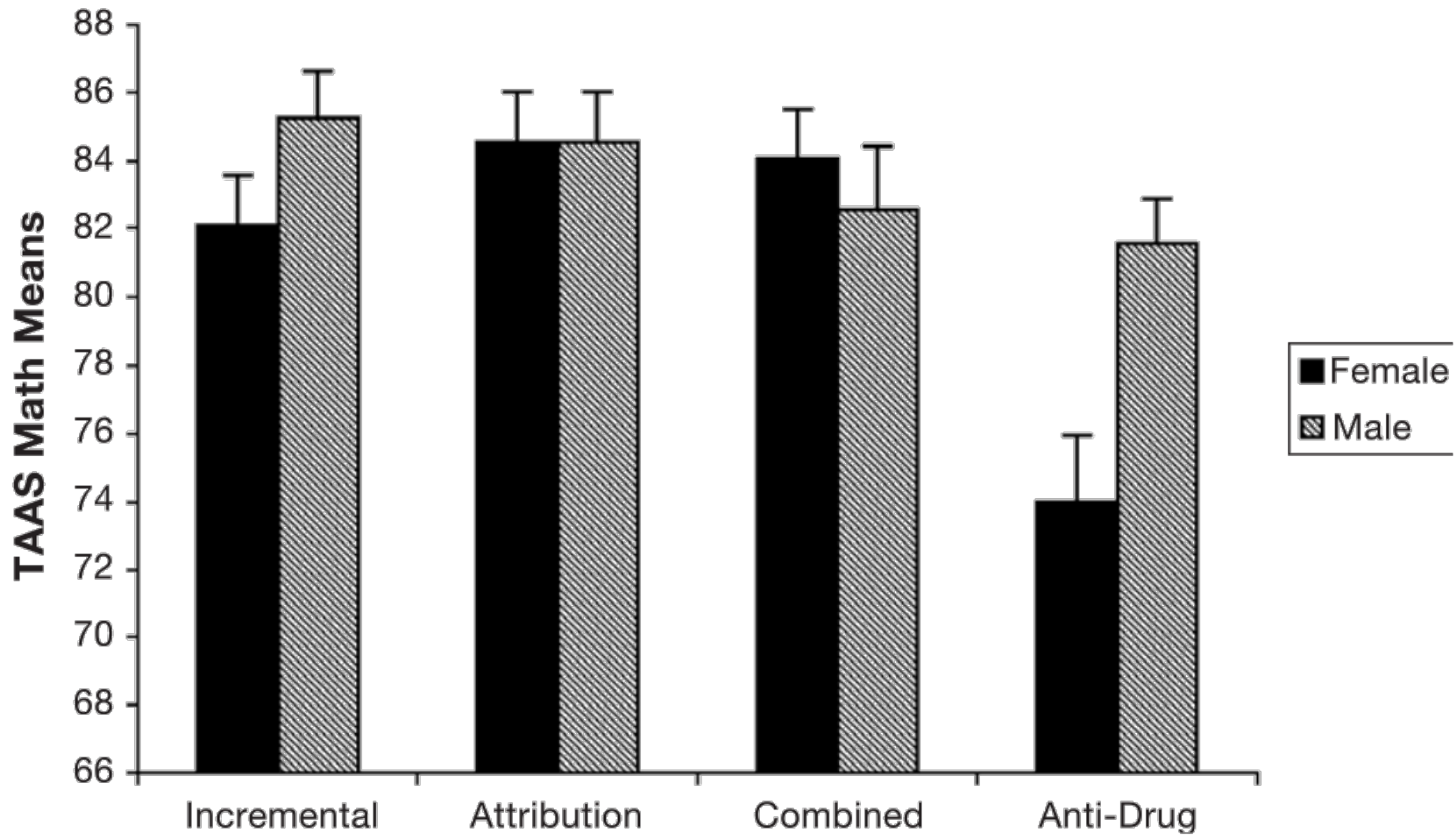
<sup>a</sup>*Department of Psychology, Columbia University, 405 Schermerhorn Hall, 1190 Amsterdam Avenue,  
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<sup>b</sup>*New York University, East Building, 239 Greene Street, 537F, New York, NY 10003, USA*

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## Abstract

Standardized tests continue to generate gender and race gaps in achievement despite decades of national attention. Research on “stereotype threat” (Steele & Aronson, 1995) suggests that these gaps may be partly due to stereotypes that impugn the math abilities of females and the intellectual abilities of Black, Hispanic, and low-income students. A field experiment was performed to test methods of



**Growth Wise Control**

Fig. 1. Average math scores on the TAAS test.

# Growth Mindset and STT

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- Growth mindset tends to
  - Cause people to continue through hard times (such as acts of bias)
  - See stereotypes as about who *tries*
    - and thus not about *me*, since I'm trying
  - (other educational benefits too)

# Instilling Growth Mindset

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- Believe it yourself
  - The part that is learned is your job...
- Use growth-centric language
  - e.g., in praise
    - “You are *X*” (fixed)
    - “You’ve learned/done...” (growth)
- State that intelligence increases with work
  - explicitly and “see how much you’ve grown”

# Classroom Culture

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- “Treating everyone like I treat people like me”
  - does treat everyone the same
  - does not make all equally comfortable
- Example: consider jokes

	Majority	Minority
Get joke	happy	happy
Not get joke	bad joke	I don't belong

# If you believe a stereotype

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- Cognitive Personal Trainer
  - Still help all (even small, frail minds) become as strong as they can
- Stereotype threat is based on awareness
  - Reducing it (by not raising awareness) still helps them
- Also, *why* is it true?
  - STT, bias, different opportunities, and...

# Unacknowledged Prerequisites

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- Fields tend to assume knowledge
- in CS, this includes *Spatial Reasoning*
  - = ability to manipulate shapes in head
  - useful for learning CS
    - a lot of spatial vocabulary, analogy
    - stack, tree, address, pointer, nested, ...
  - Correlated with play
    - FPS video games; construction toys



# Action Plan

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- Many things to do or change:
  - reduce stereotype-inducing elements of appearance, mannerisms, decor, humor, allusions
  - remove names & pronouns from examples & assignments
  - emphasize growth of intellect, in praise and correction
  - normalize struggle (personal and academic), including sharing your own struggles
  - express confidence in students
  - values affirmation activities
- Pick a few (high impact, low cost for you)
- Revisit often