Diversity in Graduate Education through Holistic Admissions Practices

Dr. Lindsay Owens

Rochester Institute of Technology

Dr. Casey Miller

Rochester Institute of Technology

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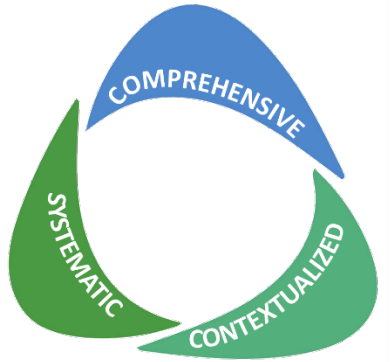
Background: Framework for Holistic Review

A Framework for Holistic Review

Holistic review is Comprehensive, Contextualized, and Systematic



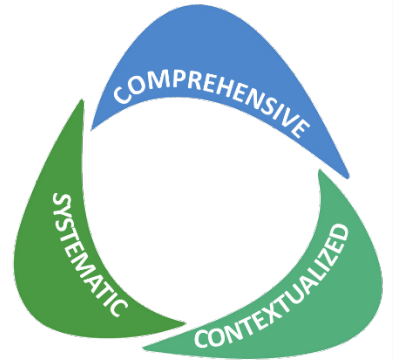
Comprehensive:

- Utilizes Numerous and diverse criteria
- Considers the whole person and the sum of their potential
  - Note that diverse perspectives improve scholarly work
- Considers that socio-emotional skills are necessary for outstanding professional performance

Developed by Casey Miller (Rochester Institute of Technology and Julie Posselt (University of Southern California)

A Framework for Holistic Review

Contextualized:



- Utilizes metrics in context
  - Note intrinsic error
  - Note societal patterns
- Looks at achievements in context
  - Considers the distributions of opportunities relative to societal patterns
  - Recognizes that achievements do not always signal aptitude or ability
- Considers students in context
  - Questions how students align with program identity/mission and broader goals

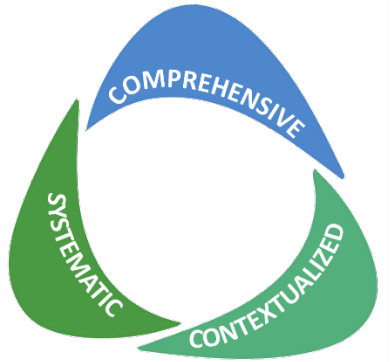
Developed by Casey Miller (Rochester Institute of Technology and Julie Posselt (University of Southern California)

A Framework for Holistic Review

Systematic

Bases review on shared, predefined criteria with structured protocols, for efficiency & consistency

- Creates space for flexibility and nuance
- Builds in safeguards & checks to promote equity and limit biases
- Selects & trains gatekeepers
- Coordinates evaluation with recruitment and yield efforts



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The Use of GRE Scores

MODULE 03

How do you use GRE Scores in Admissions?

Warm Up Activity: GRE Preconceptions

- In your opinion, what should be the lowest Quantitative GRE percentile that is still “acceptable” for an applicant to your program?
- In your opinion, what should be the lowest Verbal GRE percentile that is still “acceptable” for an applicant to your program?
- In your opinion, what should be the lowest Physics GRE percentile that is still “acceptable” for an applicant to your program?

Learning Objectives

By the end of this module you will be able to:

- Describe the content and grading process of the Quant, Verbal, and Physics GREs
- Explain how the ETS intends for GRE scores to be used
- Discuss problematic issues with using GRE cutoff scores in admissions
- Examine correlations between GRE scores and other academic measures

Overview of the Holistic Review Process

Develop Evaluation Criteria

- Build Rubric
  - Academic Preparation
  - Research Potential
  - Fit with Program
  - Non-Cognitive Variables

Systematic Review

- Evaluate Application Using Rubric
  - Read Personal Statements
  - Read Letters of Recommendation
  - Evaluate Transcripts

Application Decisions

- Discuss Evaluations
- Make Informed Decisions

Developed by Casey Miller (Rochester Institute of Technology and Julie Posselt (University of Southern California)

Why Do Graduate Programs Use the GRE?

Commonly cited reasons for using the GRE include:

- efficiently filtering a large number of applications down to a short list
- measuring general intelligence
- objectively comparing students from a variety of backgrounds
- predicting graduate school success
- providing validation of GPA

Posselt (2016); Owens – Interview Data (2017-2019)

Warm Up Activity: GRE Preconceptions

- Assume that you have to decide between these two prospective applicants, which would you admit to your program?

Student A

GRE-Verbal: 150 (~55th percentile)

GRE-Quant: 160 (~73th percentile)

Physics GRE: 580 (~23rd percentile)

Student B

GRE-Verbal: 155 (~70th percentile)

GRE-Quant: 165 (~85th percentile)

Physics GRE: 650 (~40th percentile)

The General GRE

QUANTITATIVE SECTION

- Adaptive Test
- Scores: 130 – 170 in 1 point increments
- Covers: Elementary concepts of:
  - Arithmetic
  - Algebra
  - Geometry
  - Data Analysis

According to the ETS:
"The content in these areas includes high school mathematics and statistics at a level that is generally no higher than a second course in algebra; it does not include trigonometry, calculus or other higher-level mathematics."

Educational Testing Service (2019)

The General GRE – Error of Measurement of Score Differences

QUANTITATIVE SECTION

- SEM of Score Differences: 3.0
- To be 95% confident that two scores are statistically different, they need to differ by:

$$(1.96 * SEMSD) \approx 6\ points$$

VERBAL SECTION

- SEM of Score Differences: 3.4
- To be 95% confident that two scores are statistically different, they need to differ by:

$$(1.96 * SEMSD) \approx 7\ points$$

Student A	**Student B**
GRE-Verbal: 150	GRE-Verbal: 155
GRE-Quant: 160	GRE-Quant: 165

Educational Testing Service (2019)

The Physics GRE

- Contains 100 multiple choice (5-option) questions
- Lasts for 2 hours and 50 minutes with no break
- Is a pencil and paper based test where no calculator can be used
- Scores range from 250-990 in 10-point increments
- Covers the following content areas:

• Classical Mechanics	20 questions	• Optics and Waves	9 questions
• Electromagnetism	18 questions	• Special Topics	9 questions
• Quantum Mechanics	12 questions	• Special Relativity	6 questions
• Statistical Mechanics	10 questions	• Laboratory Methods	6 questions
• Atomic Physics	10 questions		

Educational Testing Service (2019)

The Physics GRE

- SEM of Score Differences: 47

- To be 95% confident that two scores are statistically different, they need to differ by:

$$(1.96 * SEMSD)$$
$$\approx 92\ points$$

Student A

Physics GRE: 790

Student B

Physics GRE: 880

Educational Testing Service (2019)

Misconception: The GRE Measures General Intelligence

When asked in an interview-based study what GRE scores signal, participants often mentioned intelligence or GRE scores highlighting a student's ability:

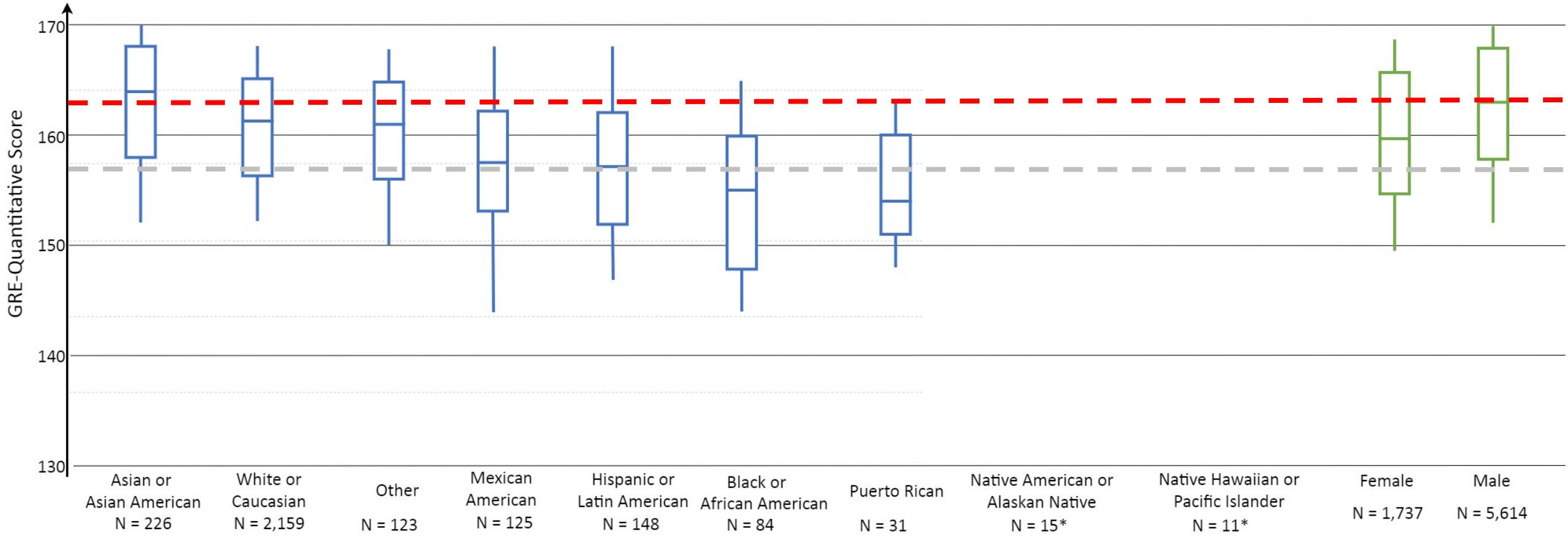
- *"And typically, sort of middling scores on GRE [like] 50, 60, 70th percentiles. Usually better on the English and math one, just because that one's kind of easy for physics students."* (Physics)
- *"Someone who does that well on the GRE is unlikely to be lame- brained. They are likely to be smart."* (Philosophy)
- "This person has a really high GRE math or something, and so they're more likely to have some technical ability" (Astrophysics)
- "*I question she has what it takes*" (Biology)
- *"I actually am in favor or GRE Quantitative because I think some of the quantitative-- and again, because I'm a theorist, I pay more attention to that. So that, I would look into that. If somebody does poorly in GRE Quantitative, that's a red flag for me."* (Physics)

Posselt (2016); Owens – Interview Data (2017-2019)

Misconception:
The GRE is an Objective Way to Compare Students from a variety of backgrounds.

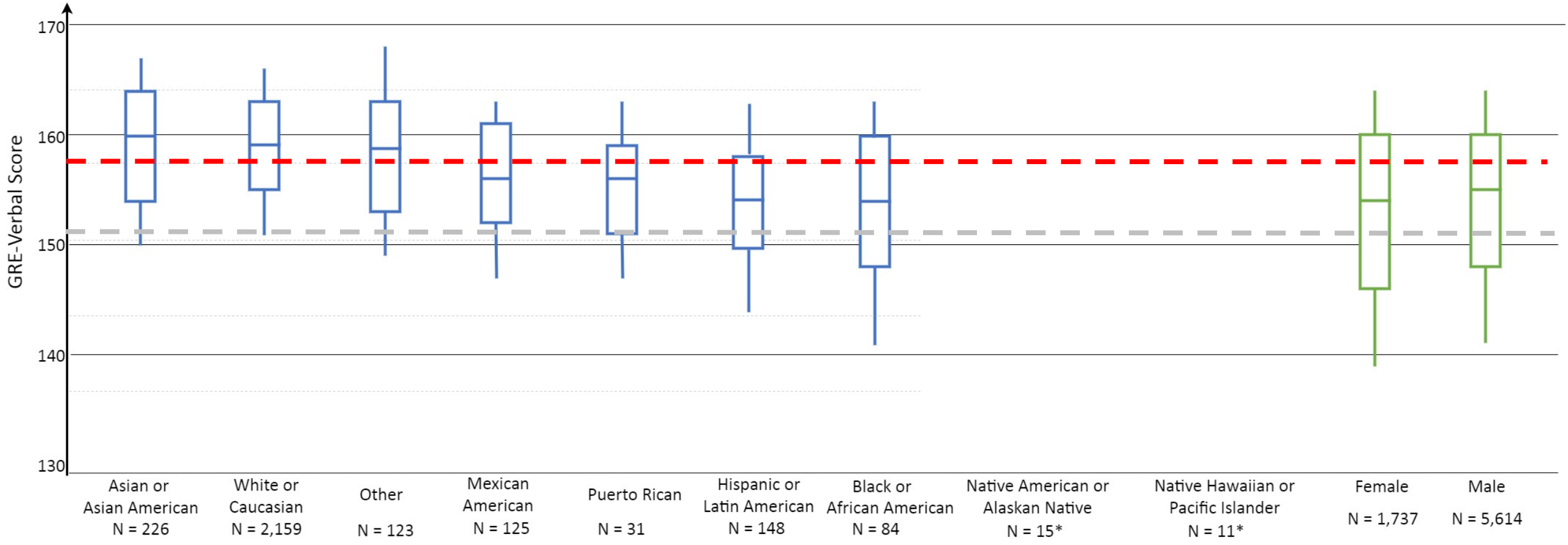
LET'S LOOK AT DATA FROM ETS…

GRE-Quantitative Percentiles for U.S. Physics and Astronomy Students (July 2017 - Jun 2018)

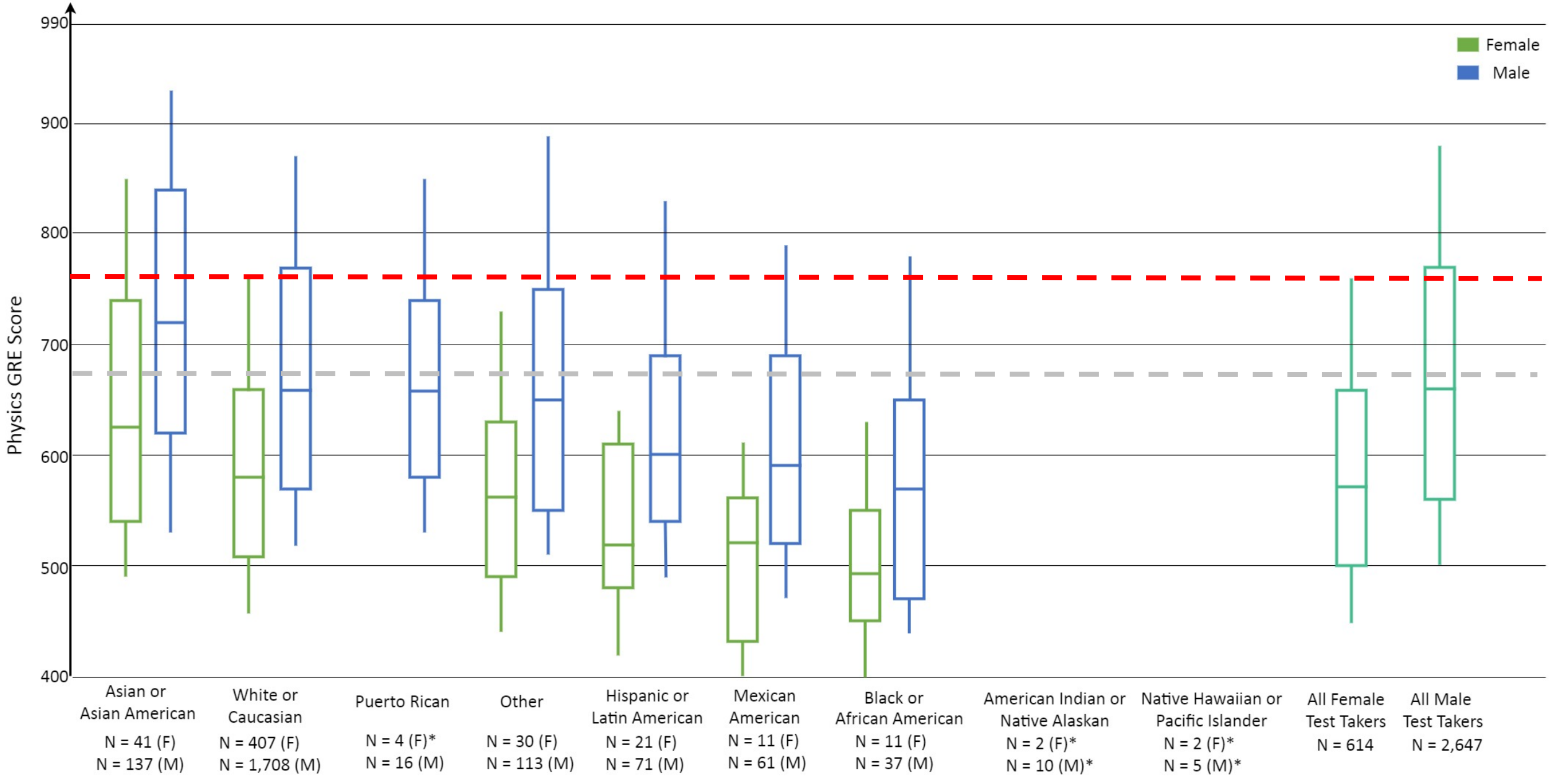


GRE-Verbal Percentiles for U.S. Physics and Astronomy Students

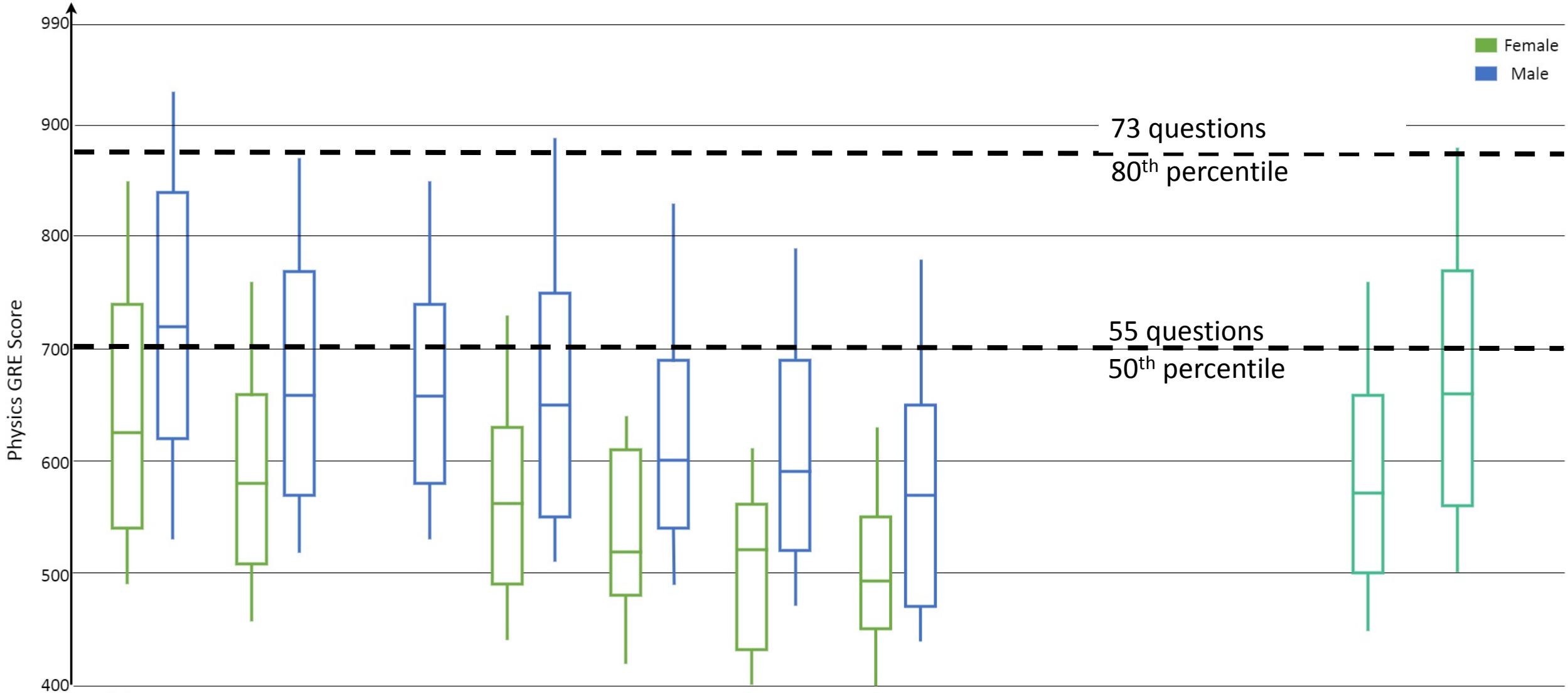
(July 2017 - Jun 2018)



Physics GRE Percentiles for U.S. Physics and Astronomy Students
(July 2015 - Jun 2016)



Physics GRE Percentiles for U.S. Physics and Astronomy Students (July 2015 - Jun 2016)



Asian or Asian American	White or Caucasian	Puerto Rican	Other	Hispanic or Latin American	Mexican American	Black or African American	American Indian or Native Alaskan	Native Hawaiian or Pacific Islander	All Female Test Takers	All Male Test Takers
N = 41 (F)	N = 407 (F)	N = 4 (F)*	N = 30 (F)	N = 21 (F)	N = 11 (F)	N = 11 (F)	N = 2 (F)*	N = 2 (F)*	N = 614	N = 2,647
N = 137 (M)	N = 1,708 (M)	N = 16 (M)	N = 113 (M)	N = 71 (M)	N = 61 (M)	N = 37 (M)	N = 10 (M)*	N = 5 (M)*		

Activity: Predictive Power

How well do you think the Quantitative GRE, Verbal GRE, and Physics GRE predictions Ph.D. Completion for physics students? Circle your answers then discuss.

		Predicts Ph.D. Completion		
Quantitative GRE	*Very Well*	*Well*	*Somewhat*	*Not At All*
Verbal GRE	*Very Well*	*Well*	*Somewhat*	*Not At All*
Physics GRE Subject Test	*Very Well*	*Well*	*Somewhat*	*Not At All*

Disciplinary Studies

Moneta-Koehler et al.; *Biomedical Sciences*

GRE is not a statistically significant predictor of

- Degree completion,
- Pass the qualifying exam,
- Shorter time to defense,
- Delivering more conference presentations,
- Publishing more first author papers,
- Obtaining an individual grant or fellowship.

GRE scores were

- Moderate predictors of 1st semester GPA
- Weak/moderate predictors of cum. GPA.

Miller et al.; 27 large *US Physics Programs*

Useful predictors of Graduate GPA

- Undergraduate GPA

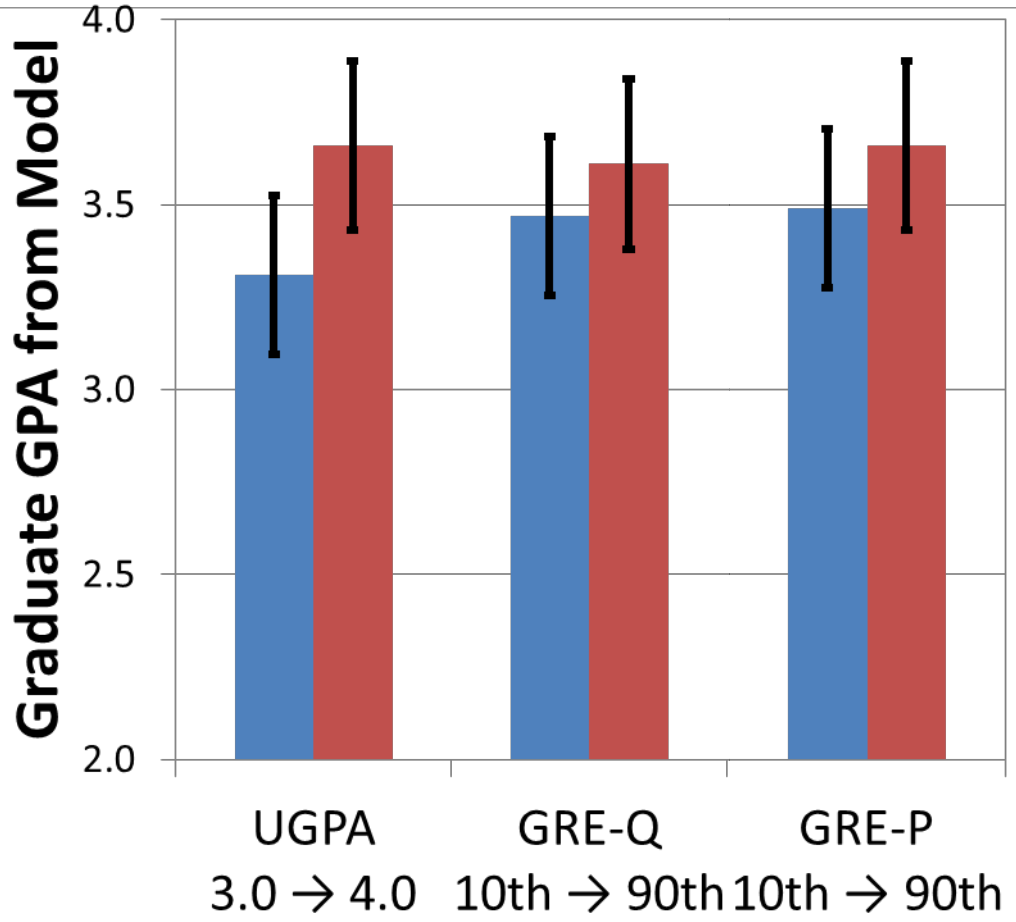
Useful predictors of PhD Completion

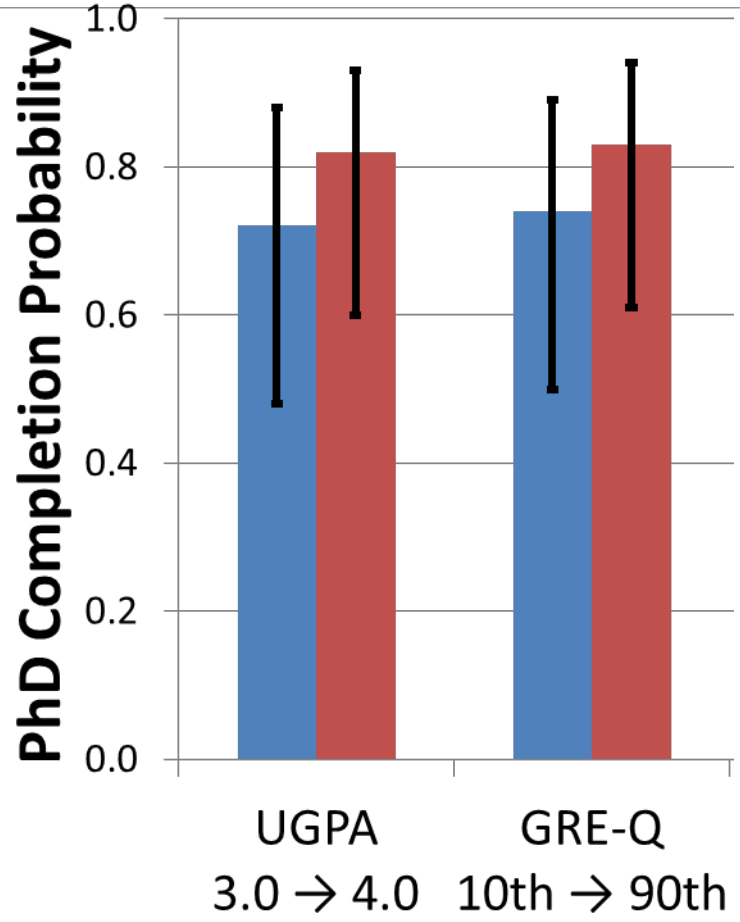
- PhD program's NRC rank

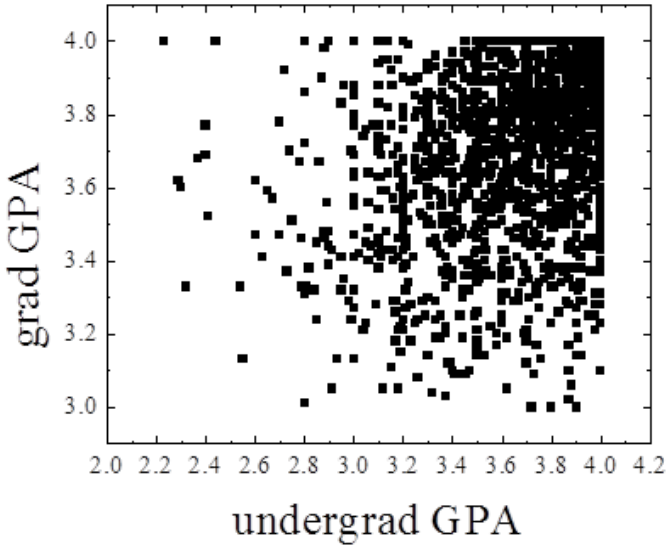
Not predictors of GPA or Completion

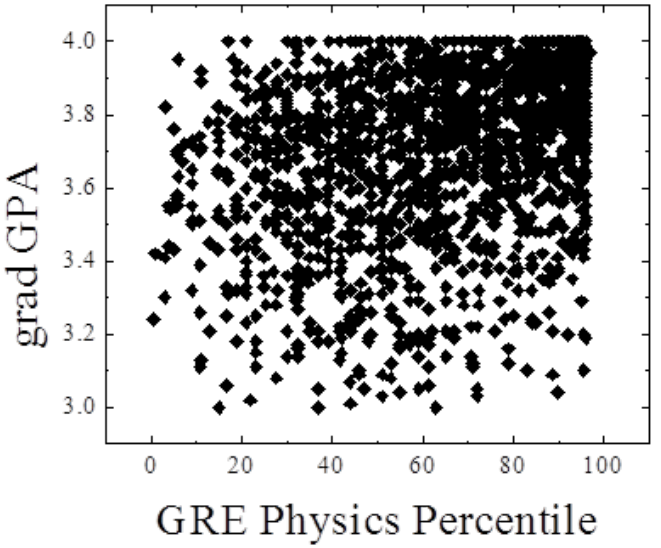
- Gender
- Race
- GRE-V

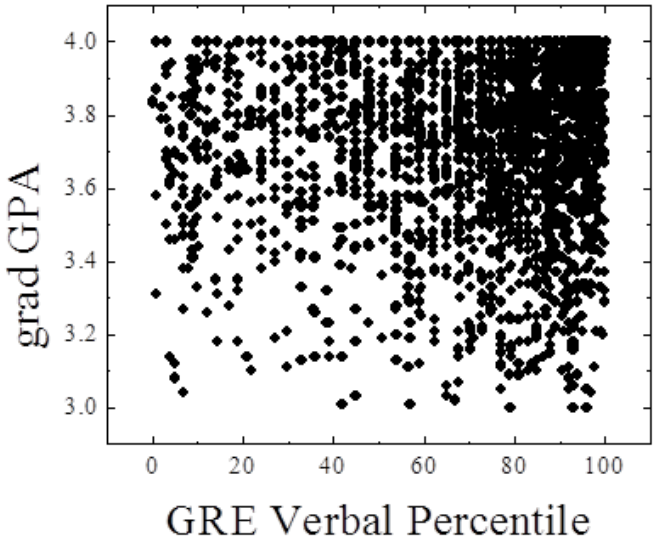
Practical Significance: Miller et al., 2009

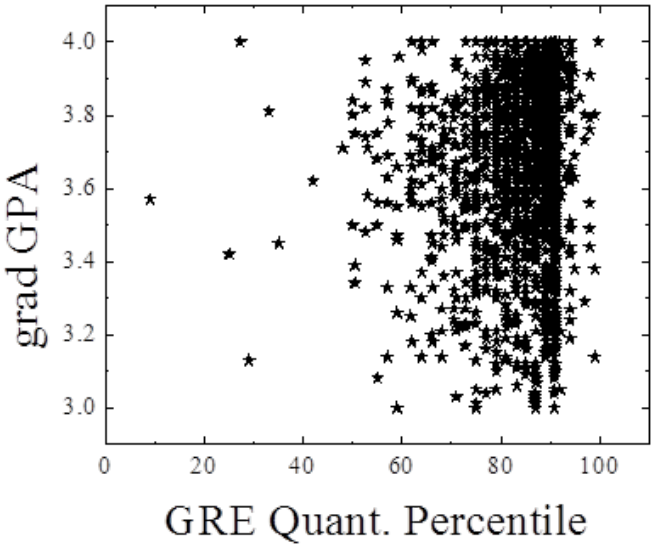












Miller et al., 2019

Why Do Graduate Programs Use the GRE?

Commonly cited reasons for using the GRE include:

- efficiently filtering a large number of applications down to a short list **Not really, once we take into account SEMSDs.**
- measuring general intelligence **Not really, high school algebra (quant) and physics concepts students may not have seen before (physics GRE).**
- objectively comparing students from a variety of backgrounds **No, it doesn't.**
- predicting graduate school success **No, it doesn't.**
- providing validation of GPA **No, GPA is a better predictor of grad school course performance than the GRE.**

A Note about Optional GRE Scores

Female graduate students in particular felt that they had to submit their GRE scores based on their perception that admissions committees would think that they were hiding a terrible score.

"I think [this program's] official position is GRE optional, right?" - Interviewer

"You didn't have to include it. And I almost didn't….but I just felt like it was suspicious not to." – Student 1

"Yeah, I think I was the same." – Student 2

"And so was I." – Student 3

"'You're not including it, does that mean that you've got a score so bad that you just don't want us to see it?' And I was like, 'Well, here it is. That's my awful score.'" – Student 1

"Unless they said, 'Do not send,' I sent them anyway because everyone was like, 'You should send, just so they don't think you got a zero.'" – Student 4

Take-away points

Raw Scores and Percentiles are not the whole story. There is associated error, and the tests are not scaled evenly.

GRE scores are not measures of general intelligence; the GRE Quantitative only covers high school level math.

GRE scores bias against U.S. women and other underrepresented groups

Physics GRE tests are taken at the beginning of senior year; unseen content can have a huge impact on performance.

GRE scores do not predict Ph.D. completion. Even the ETS says that the only thing they are intended to predict is first year grades.

Optional GRE scores still bias against women.

Discussion

Next Time:

Module 05

Identifying Non-Cognitive Qualities in Graduate Applications