Measuring Motivational and Other Psychological Factors in UREs:

An 11-Year Study of Students Funded Through Minority Science Training Programs

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Research Team

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The Science Study
Supported by the National Institutes of Health
Background: The ScienceStudy

• Prospective, propensity matched control
• Longitudinal study of students funded in NIH-funded R.I.S.E. and MARC science training programs
• Launched in 2005
• Participants from 50 campuses nationwide
• Twice yearly surveys from students
• Starting panel of 1420 students (90% Undergraduate)
  ▪ African-American, Hispanic/Latino, Native American
**PROCESS MODEL FOR RISE OUTCOMES**

**Program**
- Student-Faculty Contact (mentoring)
- Conference (attending)
- Cohort (peer support)
- Training (knowledge)
- Financial Support

** Constructs**
- **Motivation to Become a Scientist**
  - Learning motivation
  - Performance motivation (approach)
  - Performance motivation (avoid)
- **Identity as a Scientist**
  - Salience
  - Commitment
- **Efficacy to Achieve**
  - Self Efficacy
  - Self Esteem

**Outcomes**
- **Intention** to pursue graduate education in he biomedical sciences
- **Behavior**
  - GPA
  - GRE/Other
  - Schools applied to/accepted
- **Accomplishments**
  - Presenting
  - Publishing

**Undergraduate Research Experiences (UREs)**
Questions we can (begin to) answer

1. Are there elements of the RISE program that are linked with student success? (e.g., Research experience)
   • Basic effects (summative outcome):
     o Persistence
     o Graduation rates
     o Admission and completion of graduate training

2. What are the reasons for success (process)?
   • Motivation, Efficacy, Identity, & Values
1. Mediation: Research Experience

![Diagram]

- $a = 0.36^{**}$
- $b = 2.38^{**}$
- $c = 1.58^{**}$
- $c' = 0.68^{*}$

Note: $a$, $b$, and $c$ paths are unstandardized coefficients. $^{*} p < 0.05$, $^{**} p < 0.001$

Bootstrapped Indirect Effect: Mean = 0.68, $CI_{99\%} = 1.31$ to $0.45$

Sobel: $Z = 4.67$, $p < 0.001$
1. Science Baccalaureate Degree

- 2+ Semesters of High-Intensity URE
- Odds Ratio 8.62, \( p < .001 \)

SOURCE: Hernandez, P. R., Woodcock, A., Estrada, M., & Schultz, P. W., (In Preparation). Broadening the scientific workforce through undergraduate research experiences
1. Graduate Program Acceptance

- 2+ Semesters of High-Intensity URE
- Odds ratio 4.23, $p < .001$

**SOURCE:** Hernandez, P. R., Woodcock, A., Estrada, M., & Schultz, P. W., (In Preparation). Broadening the scientific workforce through undergraduate research experiences
1. Scientific Career Engagement

- 2+ Semesters of High-Intensity URE
- Odds 3.54, p < .001

**SOURCE**: Hernandez, P. R., Woodcock, A., Estrada, M., & Schultz, P. W., (In Preparation). Broadening the scientific workforce through undergraduate research experiences
2. Motivation

2. Process: Self-Efficacy

**Note:** a, b, and c path’s are unstandardized coefficients. * p < .05, ** p < .01

Bootstrapped indirect effect: mean = .27, CI_{99%} .06 to .56

Sobel: Z = 2.57, p < .01
2. Process: Identity

Research Experience

Scientific Identity (role)

Intention to Pursue a Career in the Biomedical Sciences

\[ a = 0.56^{**} \]
\[ b = 1.34^{**} \]
\[ c = 2.55^{**} \]
\[ c' = 1.80^{**} \]

Note: a, b and c path’s are unstandardized coefficients. * p < .05, ** p < .01
Bootstrapped indirect effect: mean = .75, CI_{99%} .33 to 1.23
Sobel: Z = 4.37, p<.001
2. Process: Values

Note: a, b and c path’s are unstandardized coefficients. * p < .05, ** p < .01
Bootstrapped indirect effect: mean = .27, CI99% .01 to .60
Sobel: Z = 2.43, p<.01
Acknowledgments

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Thank you!

Questions?
Longitudinal Panel

- 72% Female

- Ethnicity/Race:
  - 49% African American
  - 39% Hispanic/Latino(a)
  - 10% Other
  - 1% Native American

- Major (at Wave 0):
  - 63% Biological Sciences
  - 21% Natural Sciences
  - 12% Behavioral & Social Sciences
  - 4% Mathematics & Engineering
Key Publications


