Mindbugs: Implicit predictors of STEM engagement

Brian Nosek

University of Virginia
Project Implicit
Center for Open Science

http://briannosek.com/
Gender and Expectations

“Afraid”

“Angry”
Implicit Association Test

Demonstration
Implicit Gender-Science Stereotypes

Male Respondents

Female Respondents

Implicit Science=Male / Arts=Female Stereotyping

Number of Respondents

Male Respondents

Female Respondents

Implicit Science=Male / Arts=Female Stereotyping

Number of Respondents

70%

71%

11%

10%
Women are not being kept out of science by force so “they must be choosing not to enter, presumably because they don’t want to; presumably because (by and large) they don’t like these fields or (on average) don’t tend to excel in them, which is nearly the same thing.”

(David Gelernter, Department of Computer Science, Yale University, 1999, italics in original)
Male Advantage TIMSS (8th Grade Science)

Male = Science & Female = Liberal arts

Implicit Associations (IAT \( D \))

Nosek, Smyth, et al., 2009, PNAS
Estimated probability of majoring in science as a function of sex and implicit gender-science stereotype

Smyth, Nosek, & Greenwald, 2010
<table>
<thead>
<tr>
<th>Women</th>
<th>Implicit Stereotype</th>
<th>Explicit Stereotype</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explicit Attitude</td>
<td>-.34</td>
<td>-.09</td>
</tr>
<tr>
<td>Explicit Identity</td>
<td>-.33</td>
<td>-.08</td>
</tr>
<tr>
<td>Explicit Confidence</td>
<td>-.19</td>
<td>-.07</td>
</tr>
<tr>
<td>Expect to Participate</td>
<td>-.18</td>
<td>-.05</td>
</tr>
<tr>
<td>Self-ascribed skill</td>
<td>-.24</td>
<td>-.04</td>
</tr>
<tr>
<td>SAT performance</td>
<td>-.17</td>
<td>-.05</td>
</tr>
<tr>
<td>Average</td>
<td>-.24</td>
<td>-.06</td>
</tr>
</tbody>
</table>

Nosek & Smyth, 2011, AERJ
Implicit Gender-STEM stereotyping (IAT D)

Respondent age (cross-sectional)

N = 276
N = 509
N = 1062
N = 2017
N = 4293
N = 6978
N = 11028
N = 11616
N = 11927
N = 11141
N = 41955
N = 20904
N = 12899
Science faculty assessment of resumes

Male
John

Female
Jennifer

Less competent (d = .71)
Less hireable (d = .75)
$4,000 less starting salary (d = .60)

Moss-Racusin, Dovidio, Brescoll, Graham, & Handelsman, 2012, PNAS
http://implicit.harvard.edu/

- Black-White attitudes
- Young-Old attitudes
- Gay-Straight attitudes
- Thin-Fat attitudes
- Religion attitudes
- Skin-tone attitudes
- Disability attitudes
- Gender-science stereotypes
- Gender-career stereotypes
- American = White?
- Race-Weapons stereotypes
- Native American stereotypes

+ 36 country specific sites in 24 languages
Summary

• We do not observe our mental operations
• We cannot certain about the causes of our decisions
• Implicit assumptions (mindsets) influence decisions
• Default = Decisions made, then reasons generated
Part II
Brian Nosek (nosek@virginia.edu)

Practical steps for addressing implicit bias
Instructor as role model

Female Students

Male Students

Implicit Math Identity

Female Professors

Male Professors

Stout, Dasgupta et al., 2011
Benefits of Self-Affirmation

<table>
<thead>
<tr>
<th>Artistic expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Athletic participation</td>
</tr>
<tr>
<td>Belonging to a social group (e.g., community, racial, professional)</td>
</tr>
<tr>
<td>Creativity</td>
</tr>
<tr>
<td>Government or politics</td>
</tr>
<tr>
<td>Independence</td>
</tr>
<tr>
<td>Learning and gaining knowledge</td>
</tr>
<tr>
<td>Music</td>
</tr>
<tr>
<td>Relationships with family and friends</td>
</tr>
<tr>
<td>Sense of humor</td>
</tr>
<tr>
<td>Spiritual or religious values</td>
</tr>
</tbody>
</table>
College Physics

When Is Bias Influential?
(tentative list)

• When decisions must be made quickly
• When we are stressed or tired
• When decision-making criteria are unclear
• When information is ambiguous or incomplete
• When we are overconfident in objectivity
• When organizational climate promotes it
What to do?

1. Changing implicit biases

2. Training skills to avoid influence of bias

3. Restructuring decision-making processes
Practical Steps

1. Search for counterevidence: Team of rivals
2. Make assumptions explicit
3. Direct comparison – to standard or among candidates
4. Consider favors
5. Address self-fulfilling prophecies
6. Data!