



National Institute of  
Neurological Disorders  
and Stroke

# OPEN STAGE

webinar series

Office of Programs to  
Enhance Neuroscience  
Workforce Diversity

## Enhancing the Value of Research Findings: Activities at NINDS and Beyond

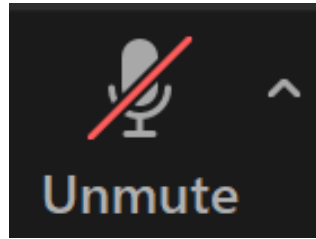
*with NINDS Office of Research Quality*

**AUGUST 1, 2023**  
**1:00 - 2:00 PM ET**

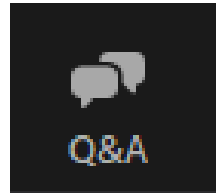
Register: <https://go.nih.gov/azFiFsJ>

# Meeting Reminders

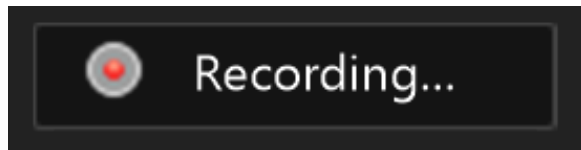
Attendees are muted



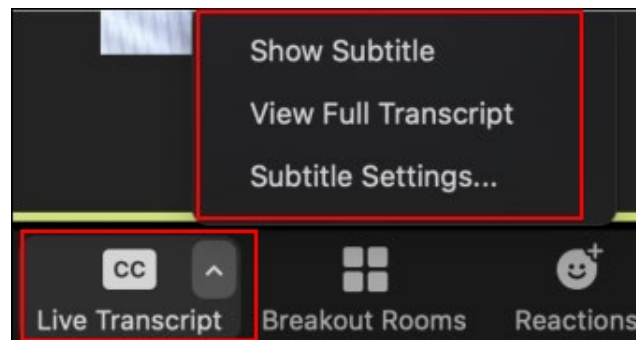
Submit questions in Q&A box



Presentation is being recorded



Live transcript available



# Stay Connected



Twitter:  
[@NINDSDiversity](https://twitter.com/NINDSDiversity)

Podcast:  
[ninds.buzzsprout.com](http://ninds.buzzsprout.com)



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# Enhancing the Value of Research Findings: Activities at NINDS and Beyond



## Disclaimer

Opinions we voice are not official opinions of NIH



Shai Silberberg  
ORQ



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OTWD



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ORQ



Devon Crawford  
ORQ

# A period of awakening



Believe it or not: how much can we rely on published data on potential drug targets?

**Beware the creeping cracks of bias**

**Why animal research needs to improve**

**Evaluation of Excess Significance Bias in Animal Studies of Neurological Diseases**

Raise standards for preclinical cancer research

**False-Positive Psychology: Undisclosed Flexibility in Data Collection and Analysis Allows Presenting Anything as Significant**

**Helping editors, peer reviewers and authors improve the clarity, completeness and transparency of reporting health research**

**When Mice Mislead**

**Bringing rigour to translational medicine**

Drug targets slip-sliding away

Unreliable research

**Trouble at the lab**

**Translating animal research into clinical benefit**

# What is experimental bias?



“The fact that the results of research or an experiment are not accurate because a particular factor has not been considered when collecting the information”

Oxford Advanced Learner's Dictionaries

# Human Nature



“Once a man’s **understanding** has settled on something (....), it draws everything else also to support and agree with it....



Unconscious Bias

....it is an innate and constant mistake in the human **understanding** to be much more moved and excited by affirmatives than by negatives.”

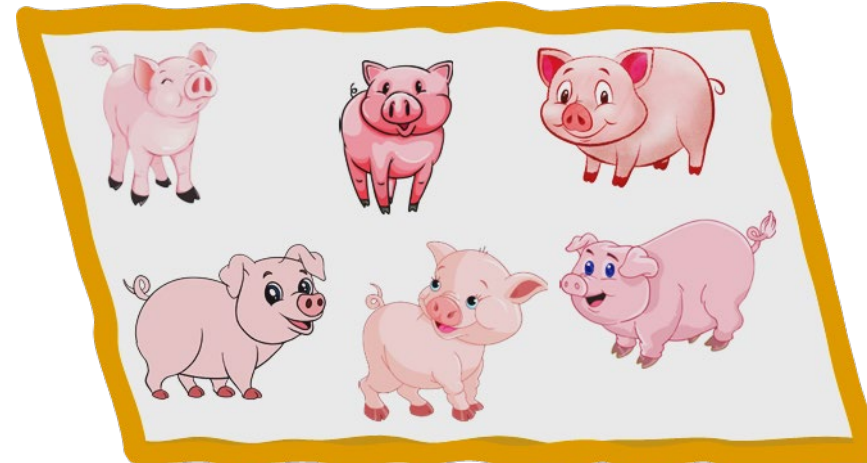
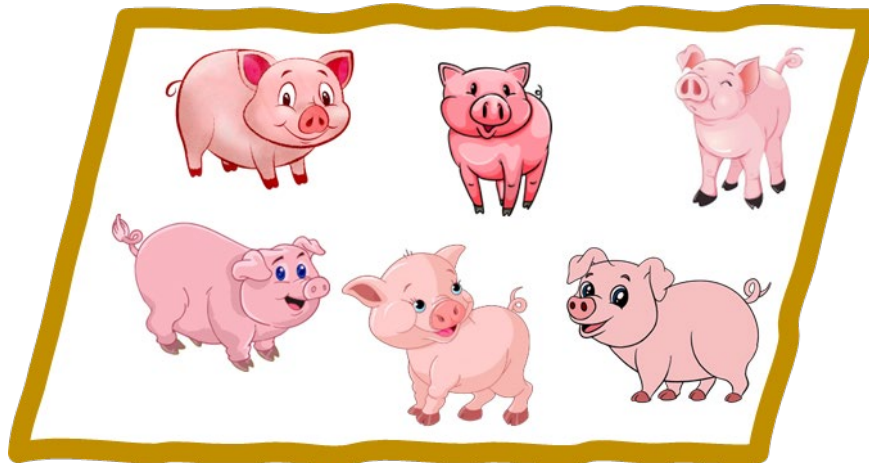


Francis Bacon  
1561-1626

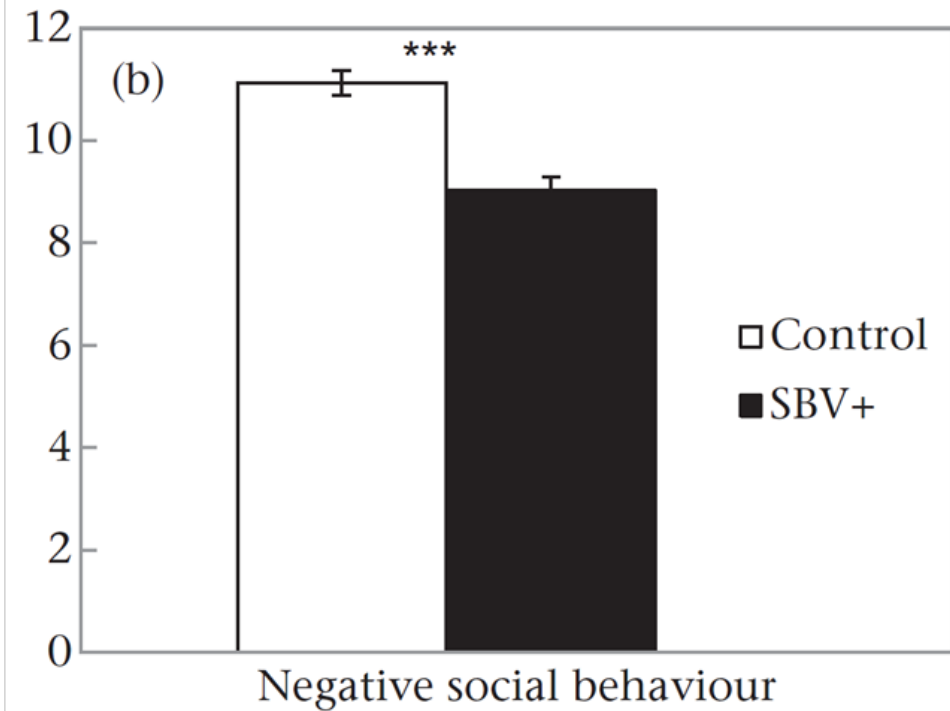
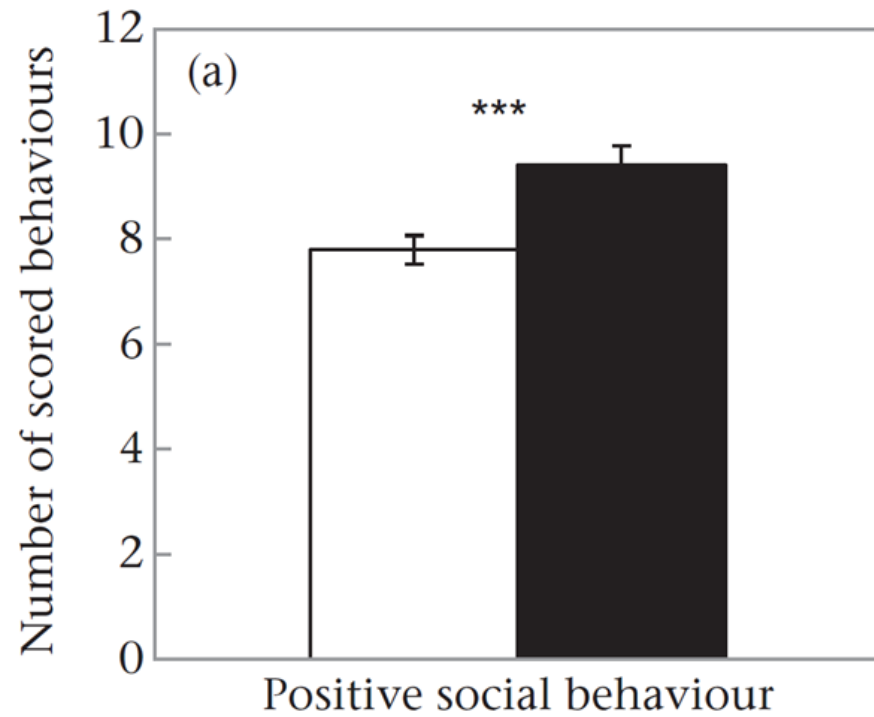
# A make-believe experiment



- Third-year veterinary medicine students
- Tally negative and positive social interaction in a pen of six fattening pigs
- Analysis based on video recordings



# Expectation bias





# Addressing experimental bias

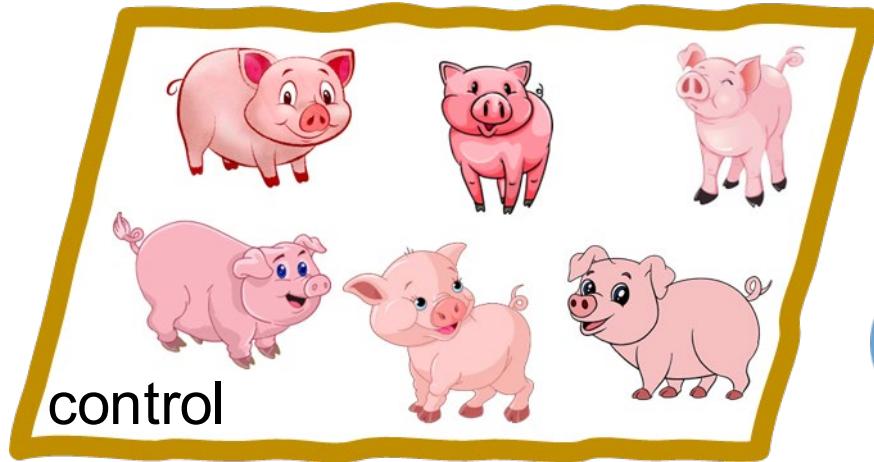


“The reliability of a study is determined by the investigator’s choices about critical details of research design and conduct”

“Bias is unintentional and unconscious”

“.....The process of addressing bias involves making everything equal during the design, conduct and interpretation of a study, and reporting those steps in an explicit and transparent way.”

# “Making everything equal during the design, conduct and interpretation of a study”



Conceal the identity of comparison groups



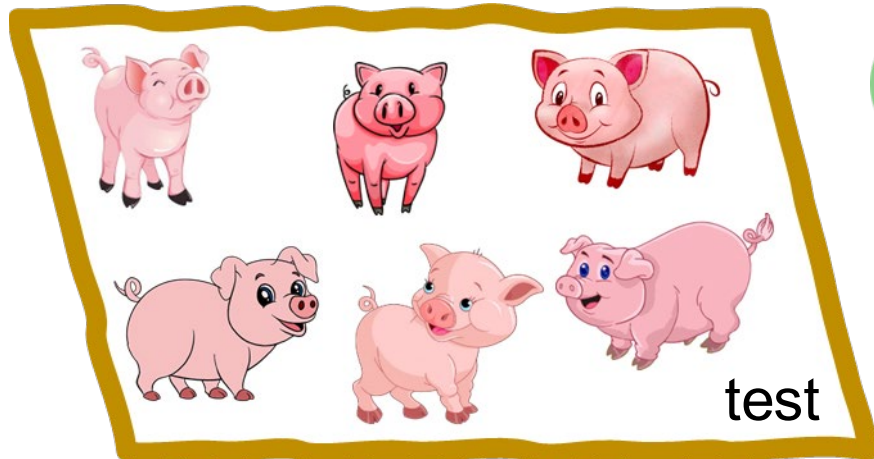
Randomly allocate samples to comparison groups



Pre-specify criteria for excluding samples



Pre-determine appropriate sample sizes

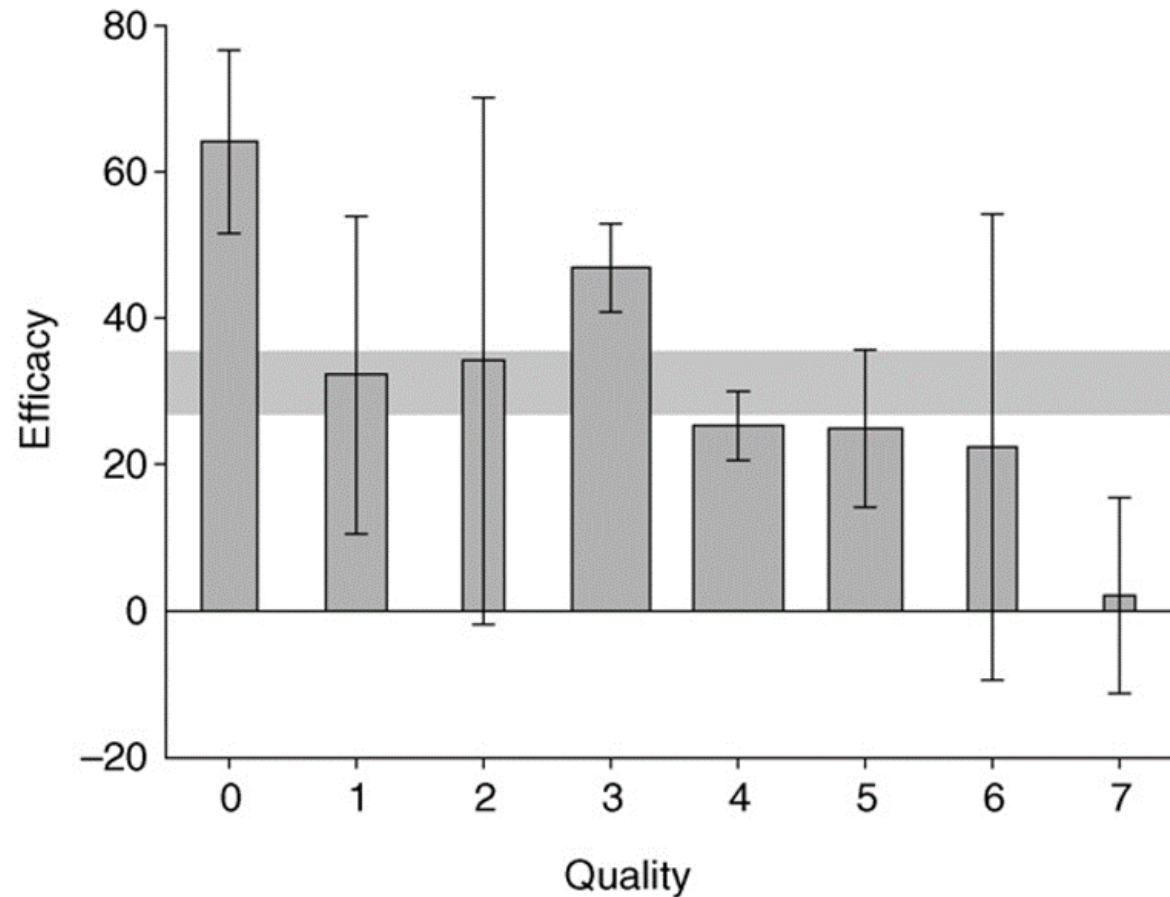


# Inadequate reporting of methodological approaches is evident for pre-clinical studies



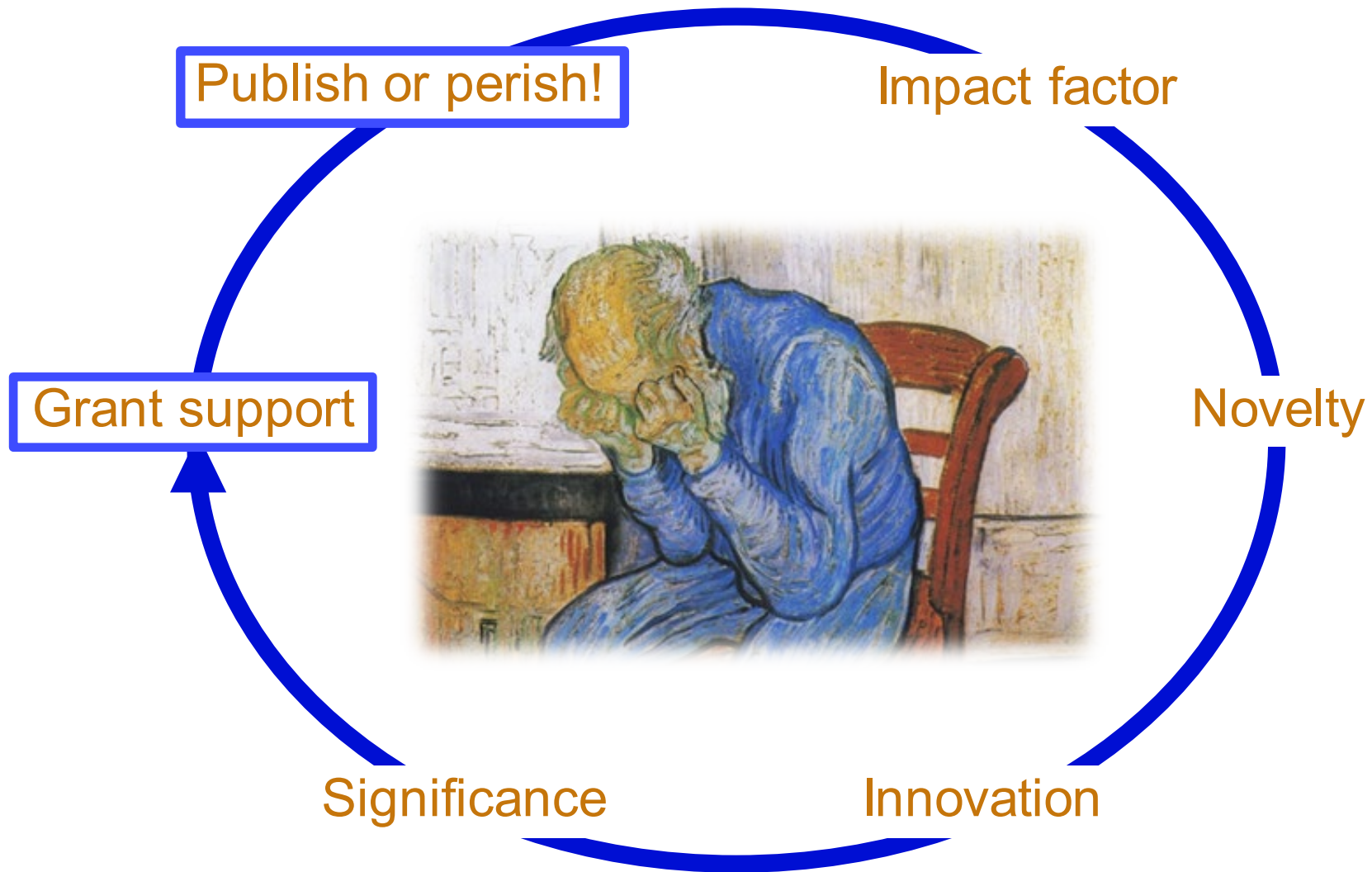
	<i>Number of publications</i>	<i>Masked assessment of outcome (%)</i>	<i>Random allocation to group (%)</i>	<i>Sample size calculation (%)</i>
Alzheimer's disease	428	95 (22)	67 (16)	0 (0)
<b>MS</b>	<b>1117</b>	<b>178 (16%)</b>	<b>106 (9%)</b>	<b>2 (&lt;1%)</b>
Intracerebral hemorrhage	88	43 (49)	27 (31)	0 (0)

The fewer methodological parameters are reported, the greater the apparent effect size!

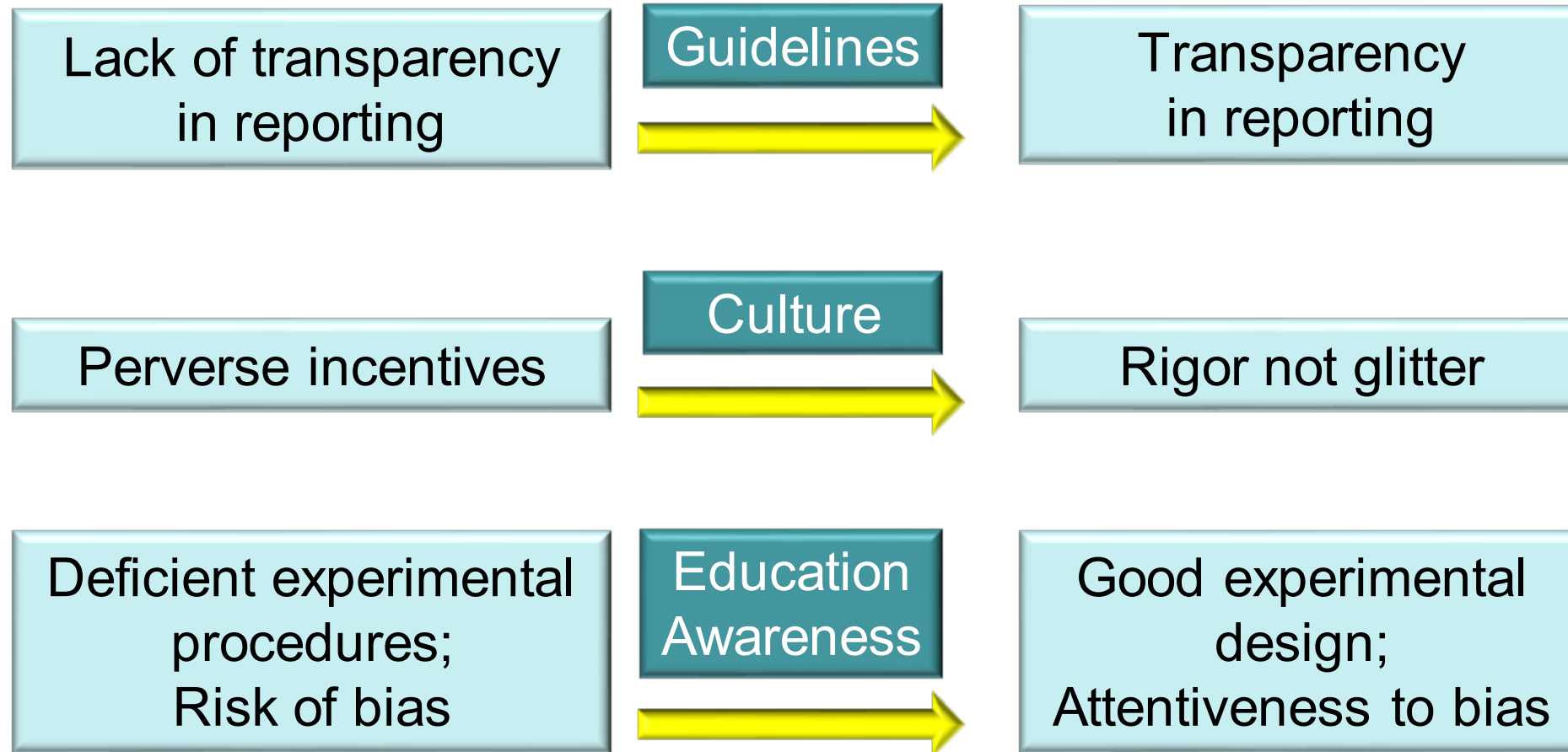


Effect size for studies of **FK506** (Tacrolimus) in experimental stroke

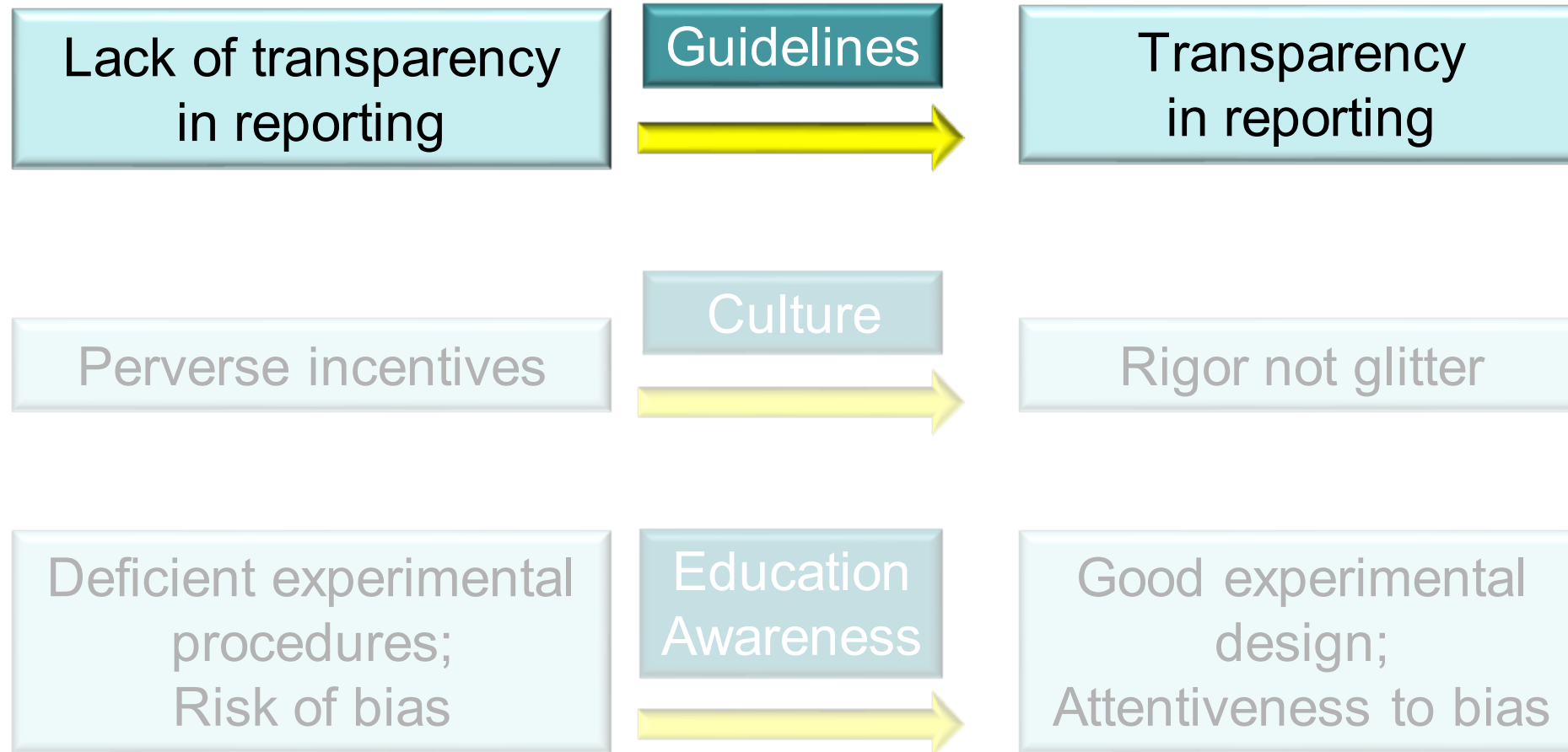
# The vicious cycle of perverse incentives



# How can we enhance the value of research findings?



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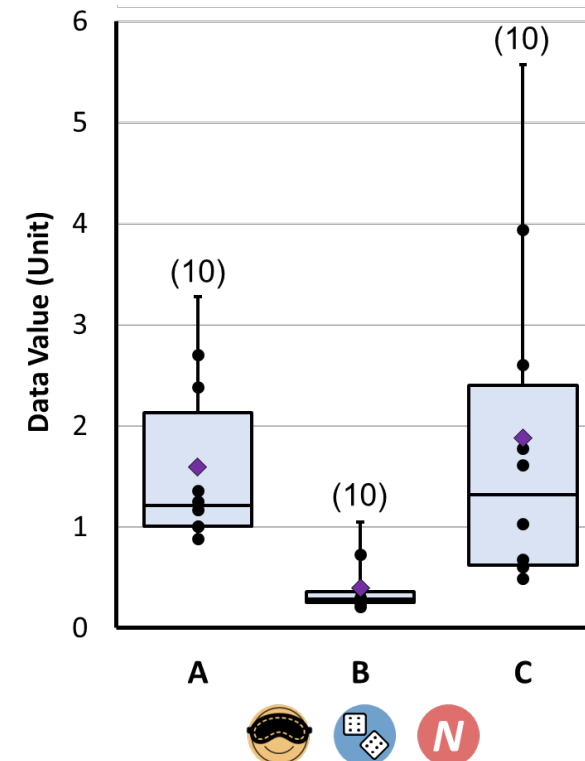


# Using Rigor Icons to Maximize Data Transparency in Scientific Presentations



- Limited space for experimental design details in scientific presentations
- Yet, details like strategies employed to mitigate unconscious biases are critical for interpreting data and assessing research quality
- Possible solution<sup>1</sup>:

Rigor-related item	Proposed icon
Experimenters were blinded/masked to treatment	
Experimental groups were randomly assigned	
Sample size/power was calculated in advance	
Outliers or other data were excluded	



<sup>1</sup>Silberberg *et al*, 2017 *Nature* 548: 153. PMID 28796229. Figure modified from reference.



# Rigor Icons Pilot: NINDS T32 Workshop

## June 5<sup>th</sup>-7<sup>th</sup>, 2023



- **Attendees:** ~165 total across 54 T32 Programs
  - 1 PI and 1-2 graduate students or postdoctoral scholars represented from each program
- **Workshop Purposes:**
  - Graduate student and postdoctoral scholar research presentations (talks and posters)
  - Discussion of scientific topics (experimental design/statistics/quantitative literacy/rigor) and professional development
  - Opportunities to learn from each other, network, and build community
- **Trainee Presentations**
  - 48 talks and 26 posters

# Rigor Icons Pilot: NINDS T32 Workshop

## June 5<sup>th</sup>-7<sup>th</sup>, 2023



### Rigor Icons that were piloted:



Experimenters were masked/blinded during experimentation and analysis



Groups were randomly allocated

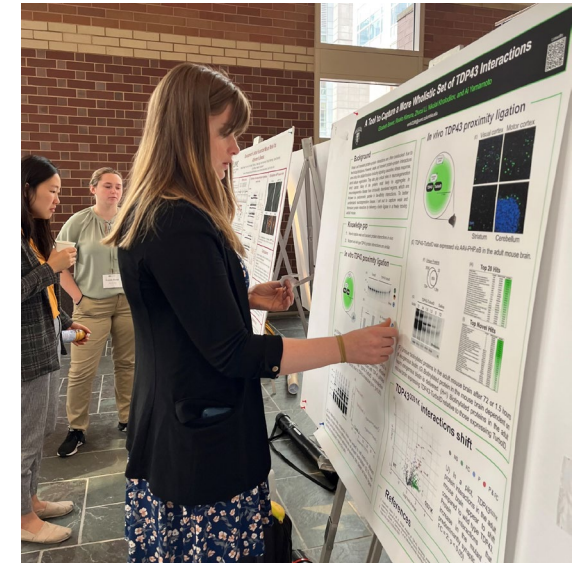
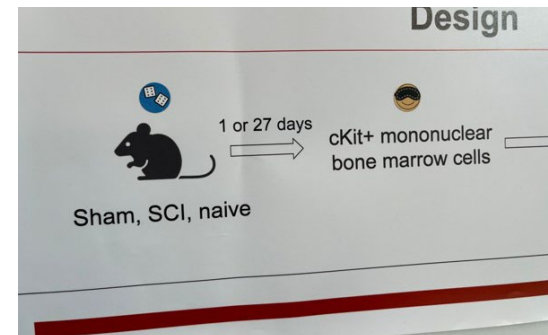
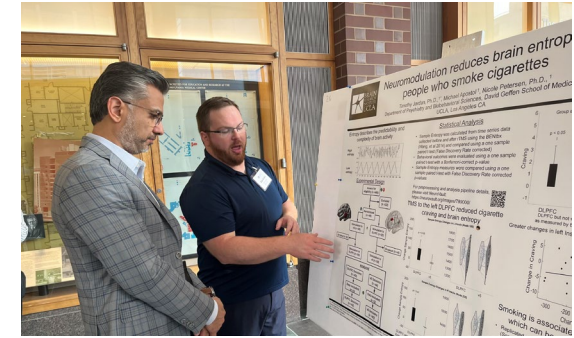
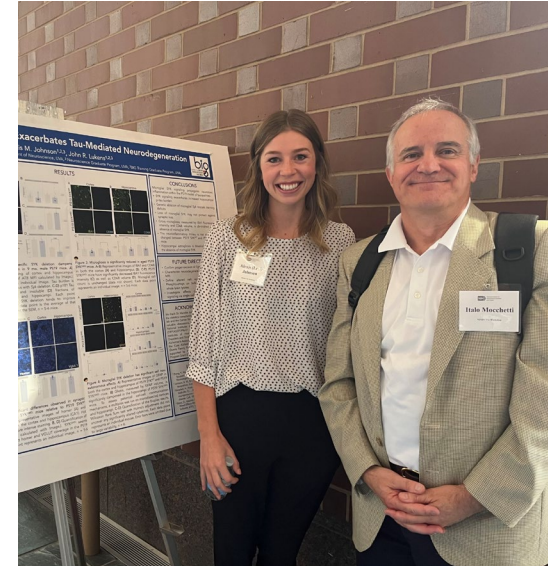


Sample size was calculated in advance



Outliers or other data were excluded

### How it went:



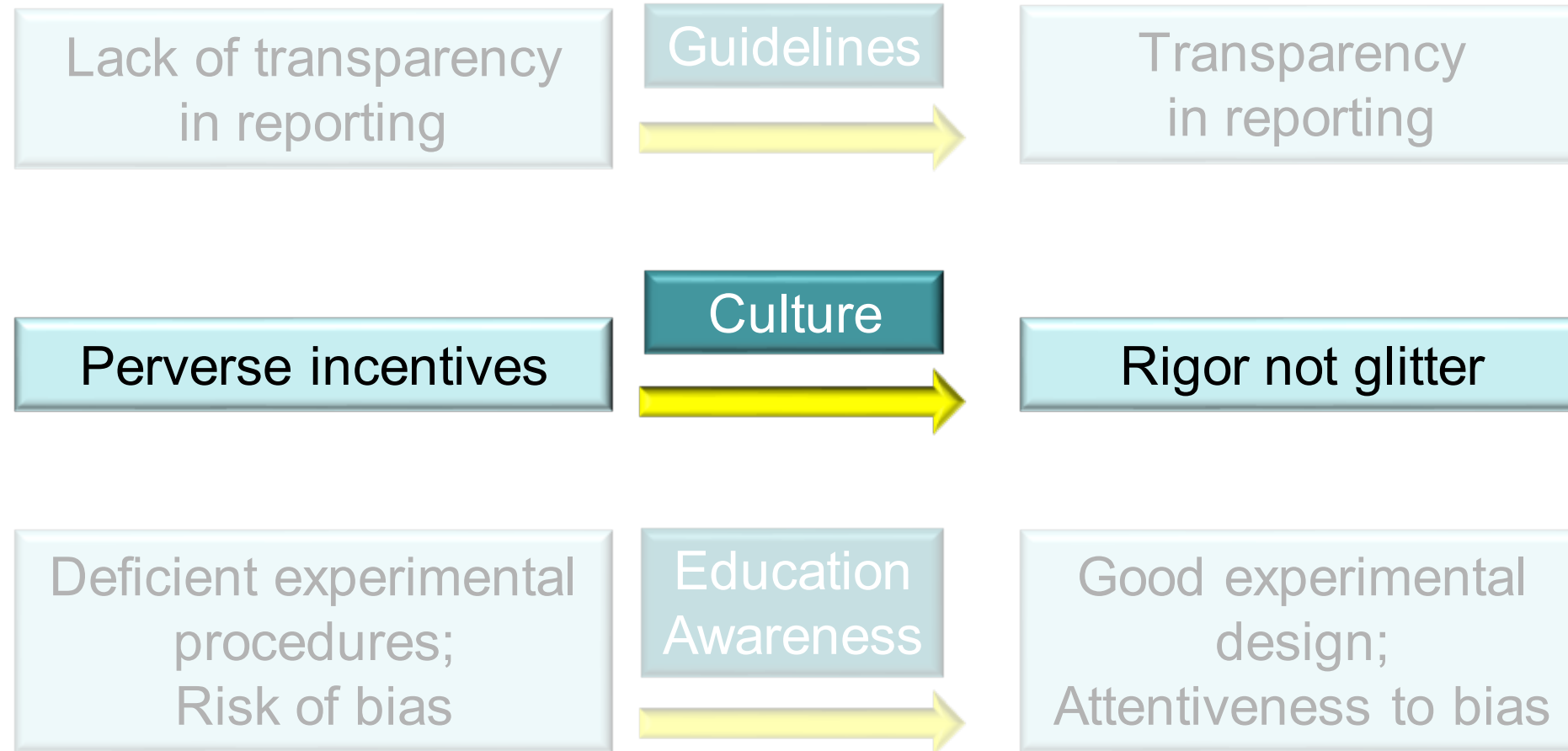
# Rigor Icons Pilot: Outcomes



- Several T32 PIs asked for the rigor icons to use at journal clubs and research in progress seminars
- Post-workshop survey questions:
  - *Did the use of rigor icons in oral presentations and posters influence the way you think about your research in the future?*

<b>Yes</b>	<b>32/49 (65%)</b>
<b>No</b>	<b>6/49 (12%)</b>
<b>Somewhat</b>	<b>11/49 (22%)</b>

# How can we enhance the value of research findings?



# The Current Incentive Structure is Not Necessarily Aligned with What We Should Value



What we should value:  
High-Quality Research



How we evaluate:  
Metrics

Transparent  
Reporting

Measures to  
reduce bias

Appropriate  
Data  
Handling

Publication  
of positive  
and null  
results

# of  
Publications

Journal  
Impact  
Factor

Grant  
Funding

H-index,  
# of  
citations

# Rigor Champions Can Drive Culture Change to Re-align Incentives with High-Quality Research



## One possible solution to culture change:

Establish communities of ‘rigor champions’ to lead grassroots efforts to enhance attention to rigor and transparency (Koroshetz, et al. *eLife*, 2020)

### Example Activities that Help Drive Culture Change



**Journal clubs or seminar series** for discussing rigor and transparency



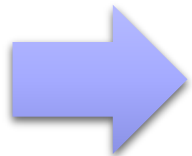
Campaigning to change policies for **graduation requirements**



**Videocast:**  
<https://go.nih.gov/AhYB7Do>

## CATALYZING COMMUNITIES OF RESEARCH RIGOR CHAMPIONS

A workshop bringing together a diverse cross-sector of individuals who promote rigor and transparency in biomedical research and are invested in catalyzing change.

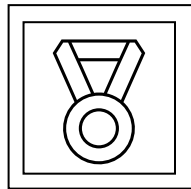


**Need incentives and rewards for promoting research quality**

# New Initiative to Recognize Rigor Champions



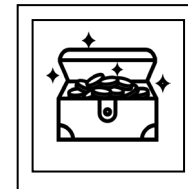
<https://www.challenge.gov/?challenge=ninds-rigor-champions-prize>



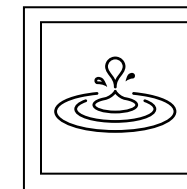
Challenge  
Mechanism



Open to all Rigor  
Champions  
across sectors



Up to five cash  
awards  
(\$10,000 each)



Reward activities  
promoting culture  
change



# New Initiative to Recognize Rigor Champions



<https://www.challenge.gov/?challenge=ninds-rigor-champions-prize>



## **Submission** (three, 500-word essays):

- Championship and Commitment
- Significance
- Impact

**DEADLINE:**  
August 15<sup>th</sup>  
11:59 PM EDT

# Upcoming NINDS Workshop at SfN



## “Doing Our Part to Change the Culture of Science: Becoming a Champion for Rigor”

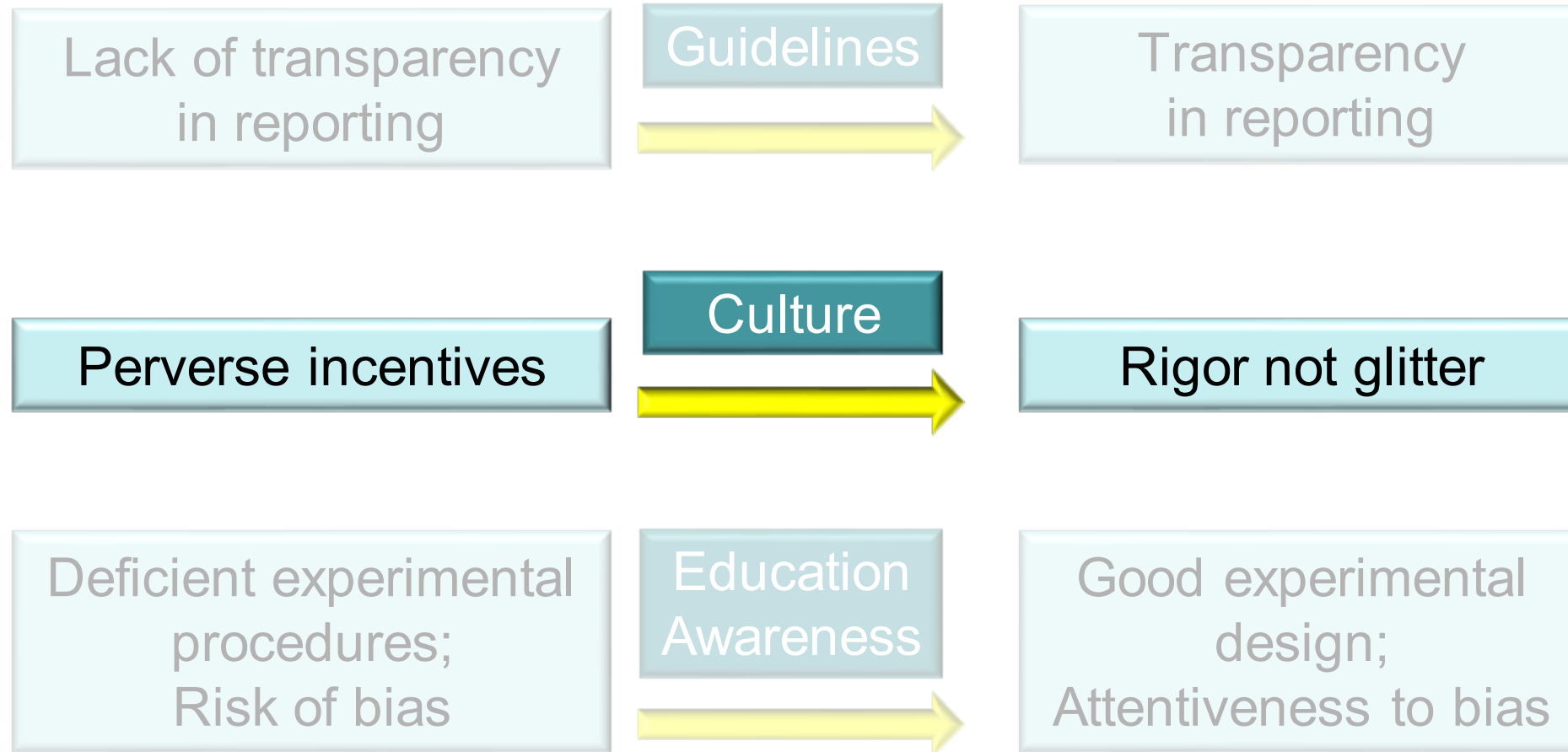


**Saturday, November 11, 2023:  
12-2 pm ET**

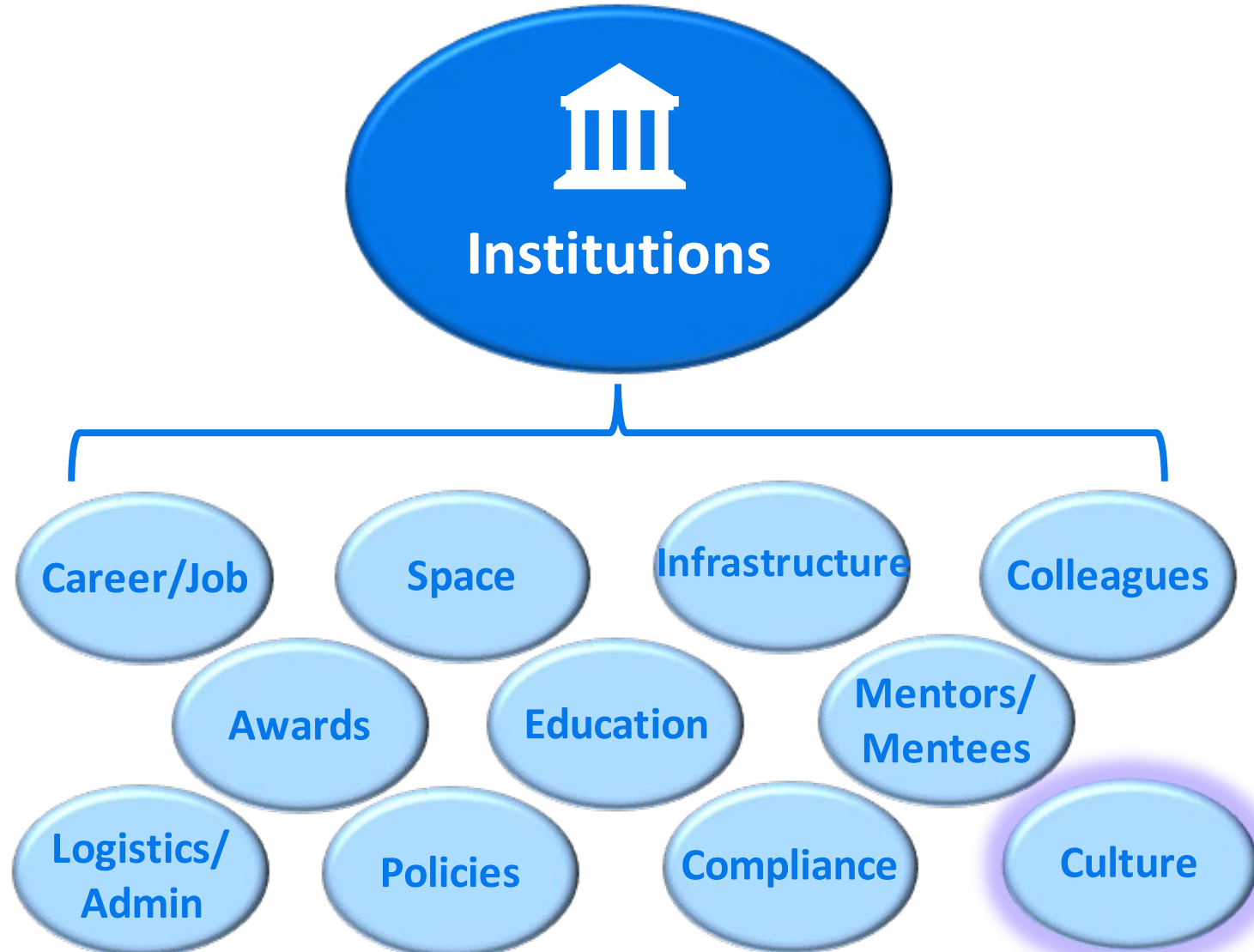
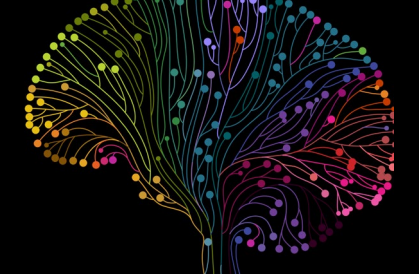
### Speakers/Discussion Leaders:

- Lique Coolen, Ph.D., Kent State University
- Michael Dougherty, Ph.D., University of Maryland
- Brielle Ferguson, Ph.D., Harvard Medical School
- Sandra Hewett, Ph.D., Syracuse University
- Nafisa Jadavji, Ph.D., Northwestern University.
- William Ngiam, Ph.D., University of Chicago

# How can we enhance the value of research findings?



# Institutional Incentives Drive Local Culture



*“Institutions must support and reward researchers who do solid — not just flashy — science and hold to account those whose methods are questionable.”*

*Begley et al., 2015 Nature*

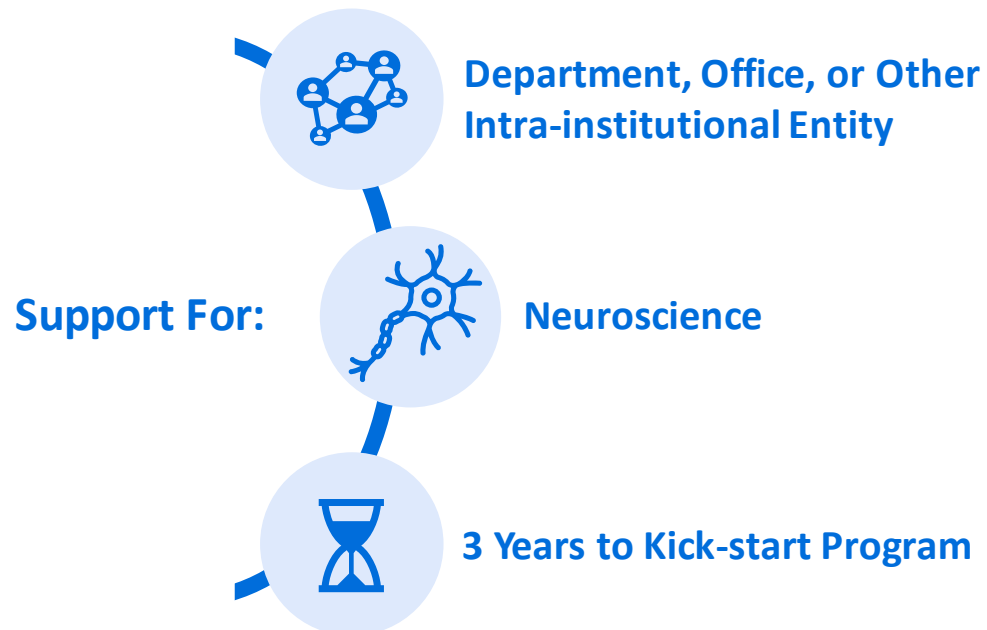
# New NINDS Effort to Change Culture



Institutions

- NINDS Sustainable Transformation of Institutional Research Rigor (STIRR) Program (RC2)

**Goal:** to support the establishment of programs to enhance research rigor and transparency practices within academic and research institutions to promote a *culture* of high-quality neuroscience research



## Program Features:

- ✓ Creative solution(s)
- ✓ Improvement of **rigor & transparency**
- ✓ Integration into **culture**
- ✓ **Evaluation** and **dissemination**
- ✓ **Sustainability** and **scalability**

# Example STIRR Programs



More Focused

Broader



Recognition and awards to promote awareness of and incentivize best practices



Appointment of **dedicated specialists** to change workflows (e.g., statisticians, data managers, research methodologists)



Restructuring of **trainee program requirements** to emphasize high-quality research over number of publications



Restructuring of **hiring, promotion, and tenure criteria** to emphasize research rigor, transparency, and quality over bibliometrics



**Policies** to enforce rigor and transparency (e.g., minimal publication reporting standards, increased expectations for time spent on replication efforts)



Development of **standard operating procedures (SOPs)** and incorporation of **new infrastructure**



Creation of comprehensive **educational** and/or **professional development programs** for staff



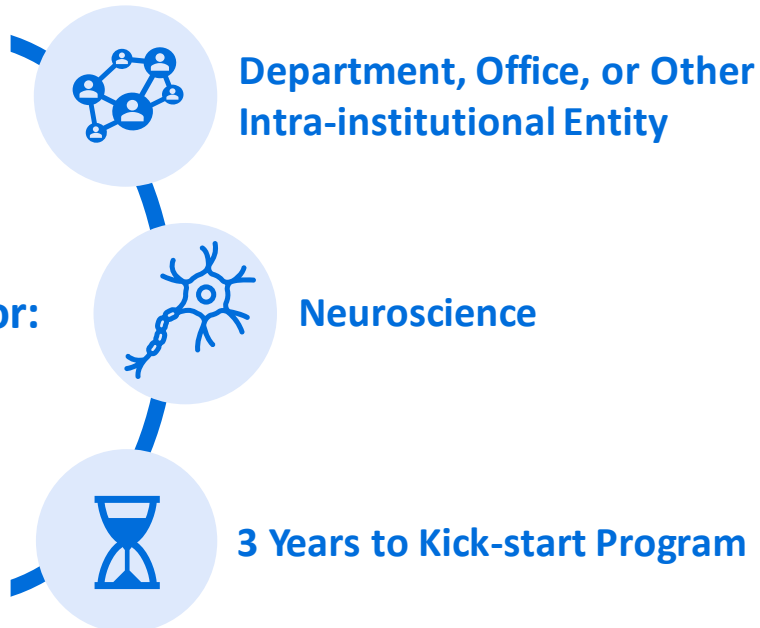
**Partnerships** with rigor and transparency-focused organizations to transform how the institutional entity operates

# Important STIRR Application Information



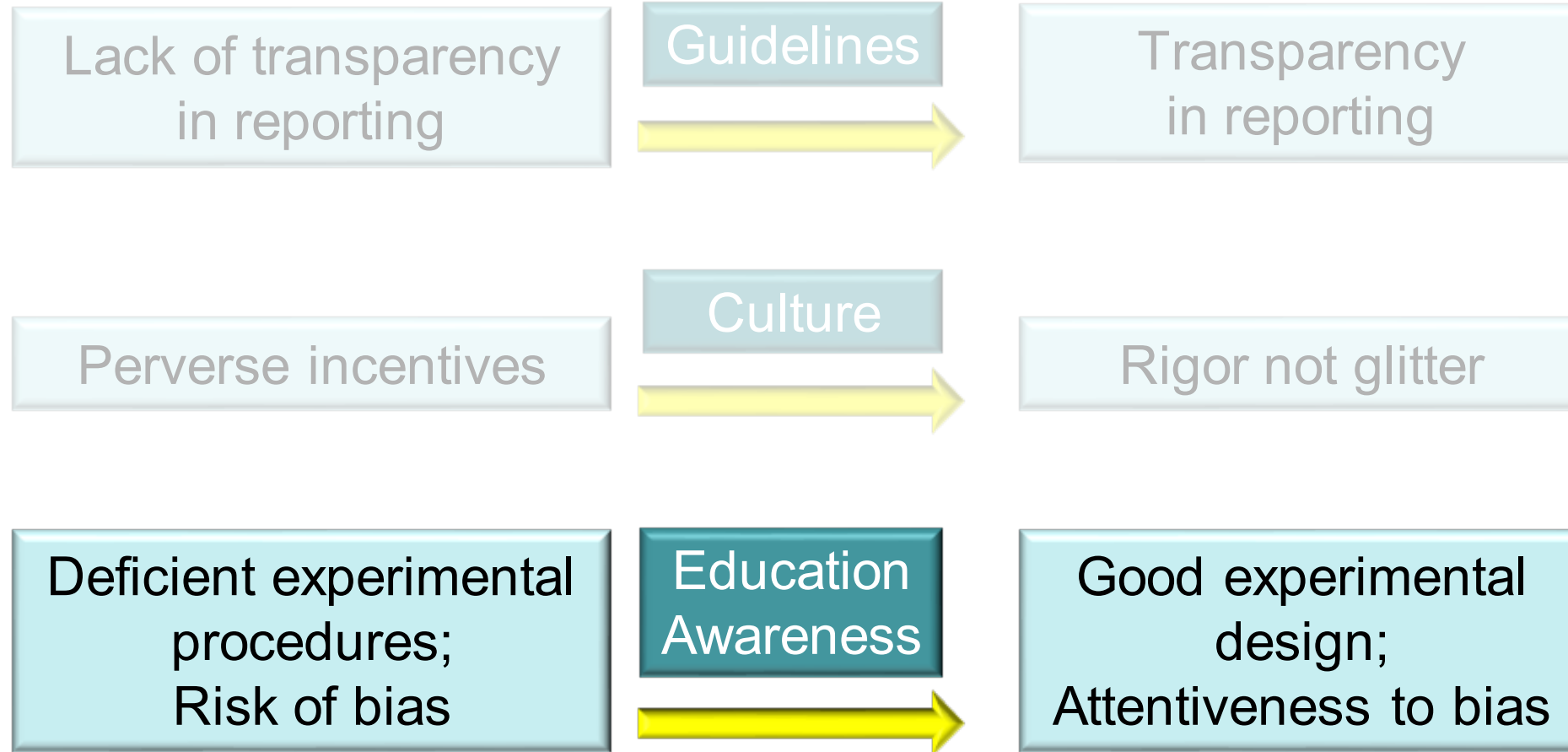
Institutions

- NINDS Sustainable Transformation of Institutional Research Rigor (STIRR) Program



- **Where to apply:** RFA-NS-24-020  
(<https://grants.nih.gov/grants/guide/rfa-files/RFA-NS-24-020.html>)
- **First receipt date:** October 17, 2023

# How can we enhance the value of research findings?





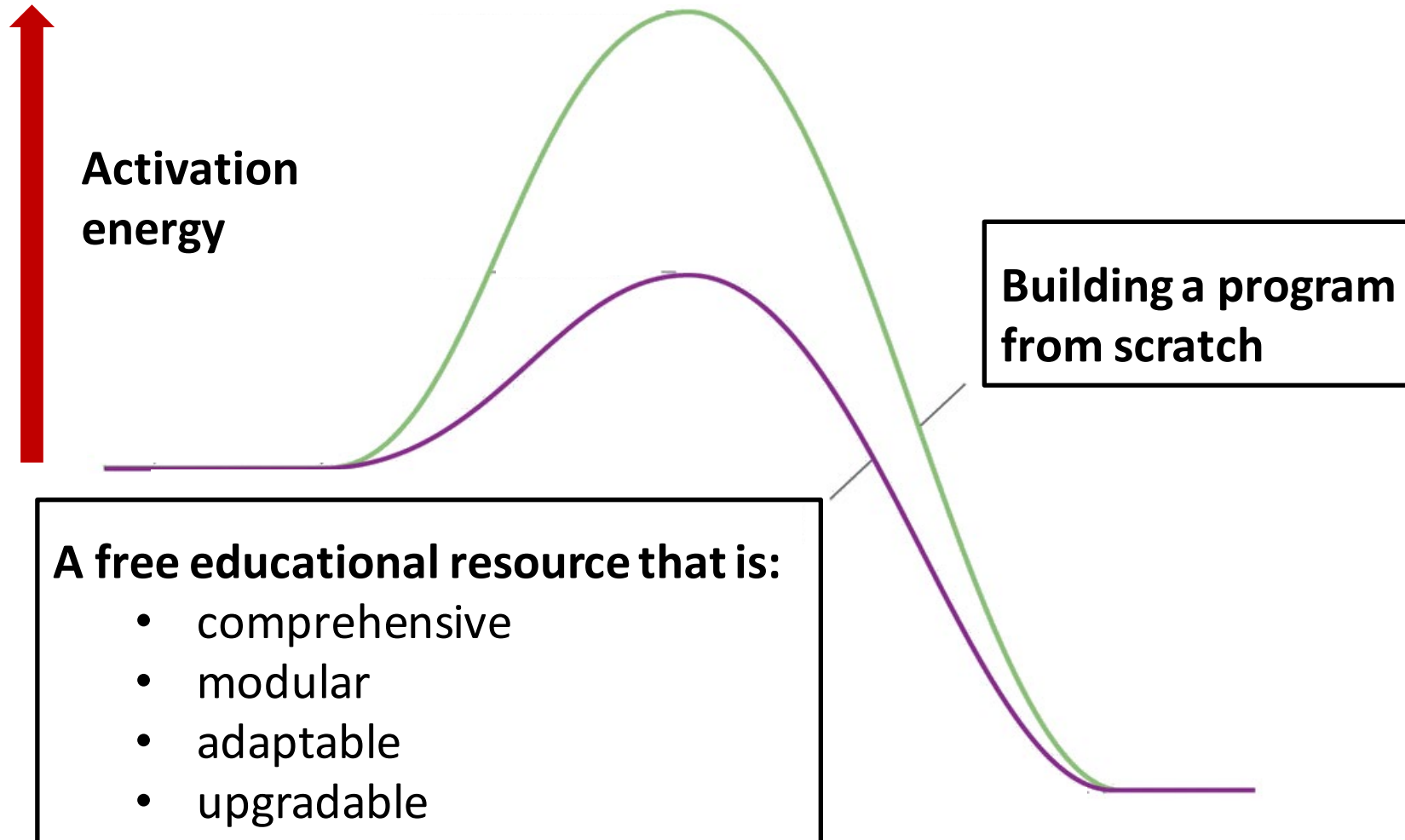
# Training in Rigor & Transparency Needs to Improve



*“Little evidence exists about the research training of laboratory scientists. The way that many laboratory studies are reported suggests that scientists are unaware that their methodological approach is without rigour.”*

*Ioannidis et al., 2014 Lancet*

# The Value of A Comprehensive Educational Resource



# Initiative to Develop an Educational Resource on Principles of Rigorous Research



**Purpose:** to facilitate teaching and learning of **fundamental principles of rigorous biomedical research** by developing an innovative **online educational resource** for a broad range of scientists **across multiple career stages** and an array of **learning environments**.

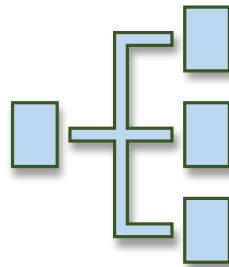
## CENTER, shaped by METERs

### Educational Resource



#### Features:

- Online
- Freely available
- Accessible
- Easily discoverable
- Attractive
- Harmonized
- User-friendly
- Engaging
- Modular
- Adaptable
- Upgradable
- 30-50 Units



## METERs, shaped by CENTER

**Educational Unit:** assortment of educational materials, lessons, and activities that **collectively address a single principle of rigorous research**



#### Features:

- Measurable, attainable **learning objectives**
- Overview with **breadth** and **depth** of the principle
- **Why** the principle needs to be implemented/applied
- **How** to implement/apply the principle
- Real-world **examples** of applying the principle
- **Interactive components & multi-modal media**
- **Instructional supports** for learners
- Additional resources



# Educational Resource Will Be Useful in Multiple Contexts



**Educational Unit:** assortment of educational materials, lessons, and activities that *collectively address a single principle of rigorous research*



## Features:

- Measurable, attainable **learning objectives**
- Overview with **breadth** and **depth** of the principle
- **Why** the principle needs to be implemented/applied
- **How** to implement/apply the principle
- Real-world **examples** of applying the principle
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- **Instructional supports** for learners
- **Additional resources**



**Customizable Classroom Teaching**



- Tailored curricula
- New scientific examples

**Modular Self-Paced Learning**



- Self-directed interaction
- Differentiated content

**Individual Guidance in the Laboratory**



- Useful resources
- Practical suggestions

# Current Awards – One Year Since Start



**CENTER**

NIH NINDS C4R

Home About Us Blog C4R in the Press Contact

## Less wrong every day

Community for Rigor is an NIH/NINDS funded initiative that will teach scientific rigor at scale.

<https://c4r.io/> [Learn More](#)

**Konrad Kording**  
University of Pennsylvania

## METER Cohort 1

### Duquesne University (Gionfriddo)

- Research questions
- Systematic literature searches
- Literature synthesis
- Literature credibility

### Smith College (Harrington)

- Overall research process
- Randomization
- Inclusion/exclusion criteria

### Johns Hopkins University (Bosch)

- Causal experiments
- Controls

### Harvard University (Born)

- Sharing of computer code
- Analysis pipelines
- Confirmation bias
- Biological artefacts

## METER Cohort 2 (August 1)

### University of Texas – Dallas (Kolber)

- Protocols/SOPs & record keeping
- Exploratory vs. confirmatory research
- Transparent reporting

### Boston University (Kramer)

- NHST/P-values
- Sample size
- Exploratory data analysis

### The Ohio State University (Gombash Lampe)

- Quantitative literacy
- Data visualization
- Data sharing

### University of Washington (Bergstrom)

- Outcome-switching
- Publication bias
- Statistical claims

# Look Out for Updates



## Final METER Receipt Date:

- October 10, 2023
- RFA-NS-21-033

## Websites:

- <https://go.nih.gov/QM2qBxn>
- <https://c4r.io/>

## Social Media:

- @NINDS4Rigor
- @comm4rigor

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Current Research

- Coronavirus and NINDS
- Focus on Disorders
- Focus On Tools & Topics
- Research Funded by NINDS
- Research at NINDS

### Initiative to Improve Education in the Principles of Rigorous Research

August 4, 2022 NINDS Press Release:  
NIH Launches Experimental Science Rigor Initiative

Good Science Is Rigorous Science  
Office of Research Quality  
National Institute of Neurological Disorders and Stroke

NIH NINDS ORQ

Follow

**NINDS Office of Research Quality**  
@NINDS4Rigor

Let's talk rigor!

Follow

**Community For Rigor** ✓  
@comm4rigor

# Take-Home Messages



- ❑ Rigor and transparency are fundamental for research
- ❑ NINDS is here to help you be more rigorous and transparent!

# Thank you!

Office of Research Quality (ORQ)

Office of Training and Workforce Development (OTWD)

National Institute of Neurological Disorders and Stroke (NINDS)

