Effects of education on risk perception: a study of Hurricane Katrina cleanup workers

Lindsey Ryckman

WETP, 2006

Outline

- **Background**
- Research questions
- Data & methods
- Results
- Conclusions & Recommendations

Hurricane Katrina: New Orleans

NASA Earth Observatory

Population Impact

Within affected region

- Disparate impact by race & class
- Post-Katrina demographic shift
- Physical & psychological health
- Economic

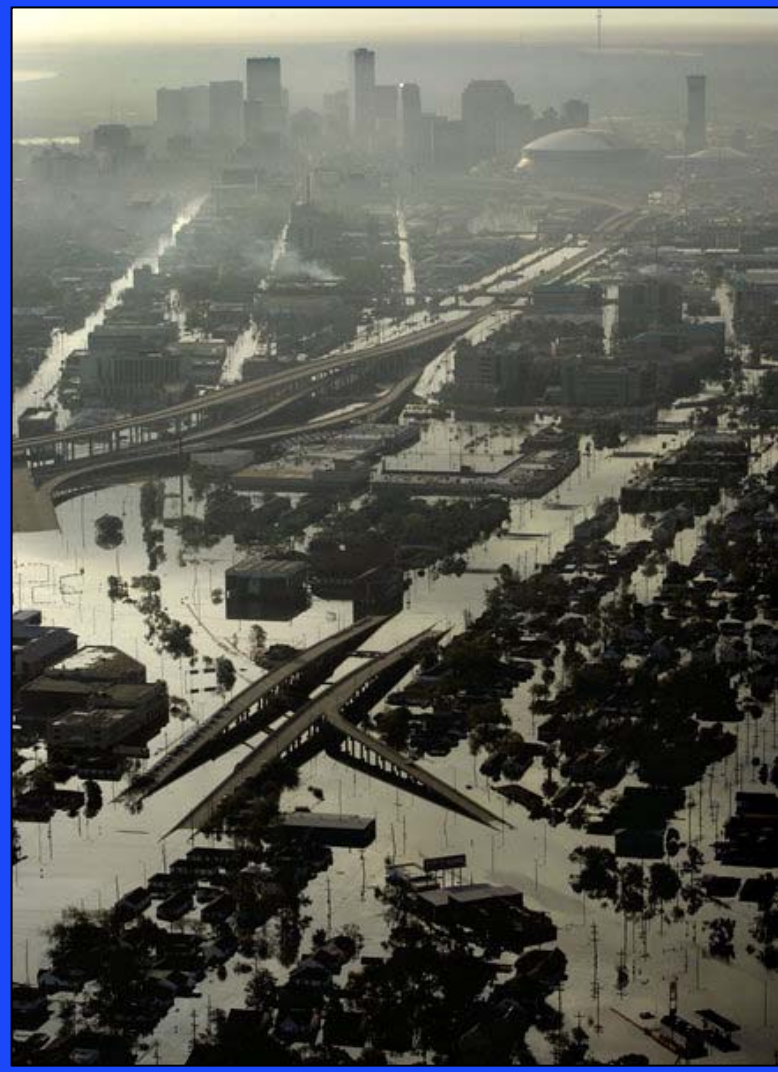
Beyond affected region

- Widespread involvement in cleanup

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Logan, 2006; LDHH, 2006, Photo: Frank Rotondo

Widespread exposure to contaminants



http://net127.com/archives/image, http://impeachforpeace.org/blog/s

Environmental Impact

Contaminants of concern

Contaminant	Sources of exposure	Health effects
Arsenic	• Pesticide Sprays • Combustion of fossil fuels • Arsenic-treated wood	• Cancers: skin, lung, bladder • Nervous system damage
Lead	• Industry and consumer products • Paint, fuel, batteries, pipes	• Developmental & reproductive damage • Nervous system damage
Polycyclic Aromatic Hydrocarbons (PAHs)	• Smoke from petroleum products • Medicine, plastics, pesticides, asphalt	• Cancers: respiratory & digestive tract, lung • Respiratory, gastrointestinal, reproductive, & immune system damage

- Other health concern: Mold spores

Pardue et al., 2005; Presley et al., 2006; EPA, 20

Cleanup concerns: protection from contaminants

Personal Protective Equipment (PPE)

- Respirator

- Protective clothing
- Gloves
- Boots
- Goggles

http://www.peoplesfreespace.org

Why is PPE use important?

- Minimize illness and injury from known hazards
- Protect against unknown hazards and possible exposures
- Recommended by Occupational Safety and Health and Administration (OSHA) & Center for Disease Control (CDC)



Reported health conditions in Hurricane Katrina disaster responders

Emergency responders with respiratory conditions acquired after starting cleanup

	Cough (%)	**Phlegm (%)**	**Wheeze (%)**
Police officers n= 845	21	13	4
Firefighters n= 525	23	16	6

Herbstman et al., 2005

Inconsistent use of PPE

In post-Katrina workers cleaning mold in homes

	Inconsistent Use (%)
Professional Workers n= 69	35
Residents n= 67	69

CDC, 2006

Why is health & safety training important?

- Practical public health intervention
- Equips workers with knowledge on how to protect themselves
- Part of emergency preparedness

Who gets training?

Worker type

***Professional*: specific to emergency response**

Police, firefighters,construction workers

→

Training

Approved by OSHA

Standardized, specific

***Volunteer*: Non-specific to emergency response/professionals**

Residents, utilities/services personnel

→

Not approved by OSHA

Non standardized, general

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Research questions

1.) Does training affect risk perception, and does this effect vary by worker type?

2.) Does training affect anticipated PPE use, and does this effect vary by worker type?

3.) What factors limit training effectiveness, as measured by changes in risk perception and anticipated PPE use?

How to assess training effectiveness

- Worker perception and knowledge of hazards
  - Before & after training
- Worker perception, knowledge, and use of protective behavior
  - Before & after training
    - Eg. PPE use on the job

Fieldwork in New Orleans during housing crunch

My home in New Marigny

My walk-in closet

Materials and methods

Survey methods

- Convenience sample: 276 workers
- 2 structured surveys:
  - Before training
  - After training

Analytical Methods

- Differences in survey responses
  - Before/after training
  - Between worker groups
- Worker characteristics influencing responses

Study population

- Professional workers
  - OSHA approved training, n=35
    - Environmental Management and Training
    - United Steelworkers Union
- Volunteer workers
  - Not OSHA approved training, n=241
    - Common Ground
    - ACORN
    - Hands On New Orleans
    - RHINO Project

Population characteristics

Characteristic	Volunteer	Professional
Sex	46% Male	77% Male
Age	48% Ages 18-24	45% Ages 35-50
Race	86% Caucasian	80% African American
Education	72% > High school	60% > High school
Lived in affected region	10%	90%
Experienced another hurricane	32%	59%
Participated in cleanup	9%	57%
Ongoing health condition	18%	25%

Survey question 1: **Risk perception**

The following health concerns could exist when cleaning damaged sites in New Orleans. Please **RANK (1-4)** your opinion about the level of risk each item poses to your health.

- Heat-related illness
- Personal injury
- Lack of access to emergency healthcare
- Short term illness from exposure to: Mold, Contaminated soil
- Long term illness from exposure to: Mold, Contaminated soil
- Respiratory illness

Survey question 2: **Anticipated PPE use**

The following are situations in which you might wear protective equipment. Please **CIRCLE ALL** equipment you would wear in that scenario:

Scenario

- **Removing** damaged belongings from home
- **Demolition** work (ie.- wall & floor removal)
- **Washing** moldy surfaces
- **Sweeping** floors and dusting
- **Repair** or removal of roofing

Equipment

- Protective suit
- Respirator
- Gloves
- Goggles
- Booties

Survey question 3: **Barriers to PPE use**

What challenges/barriers do you believe might prevent you from using protective equipment? **CIRCLE ALL THAT APPLY:**

- Affordability
- No access
- Uncomfortable
- No need

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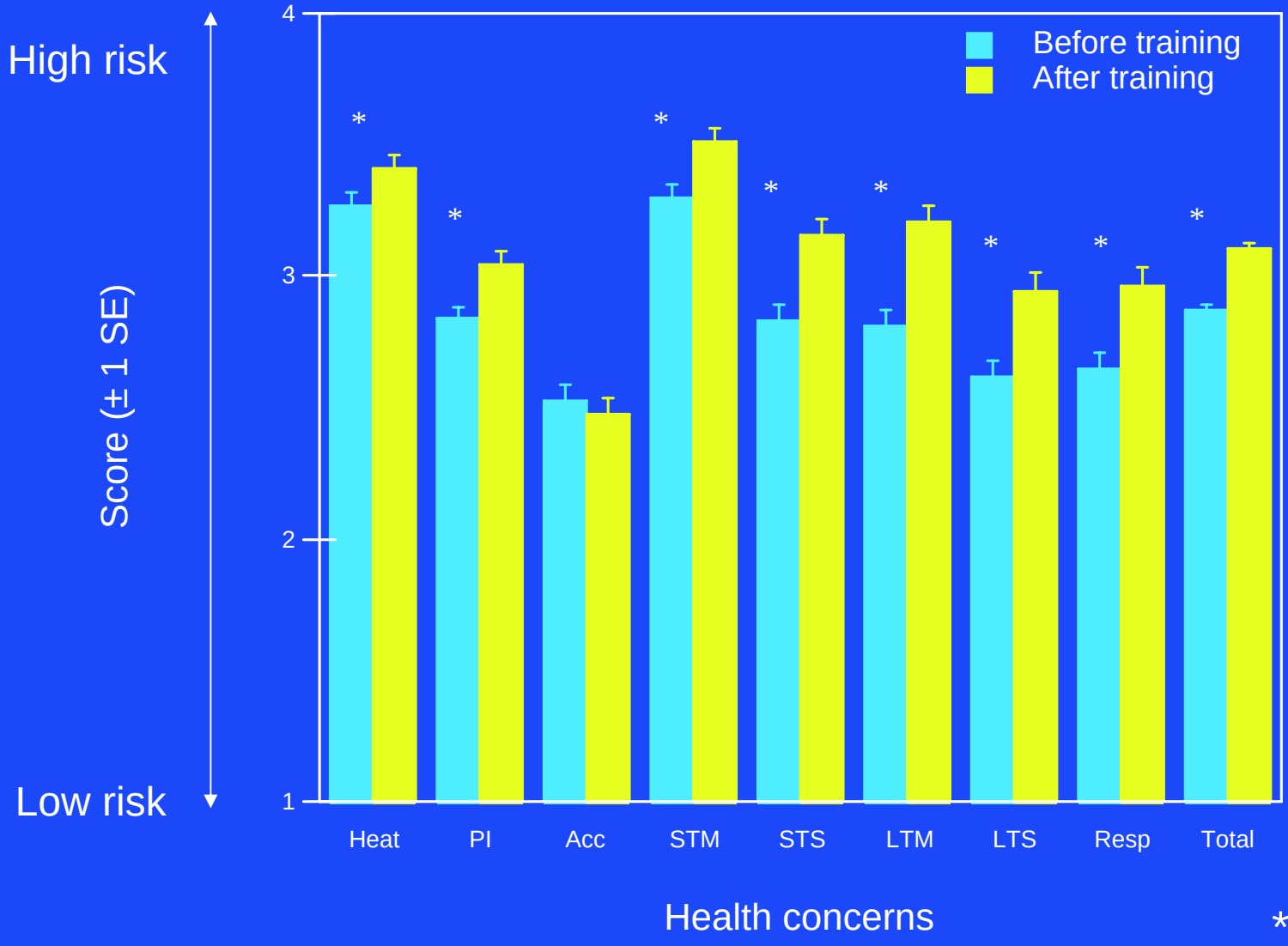
Question 1: Risk perception

Volunteer risk perception scores before and after training

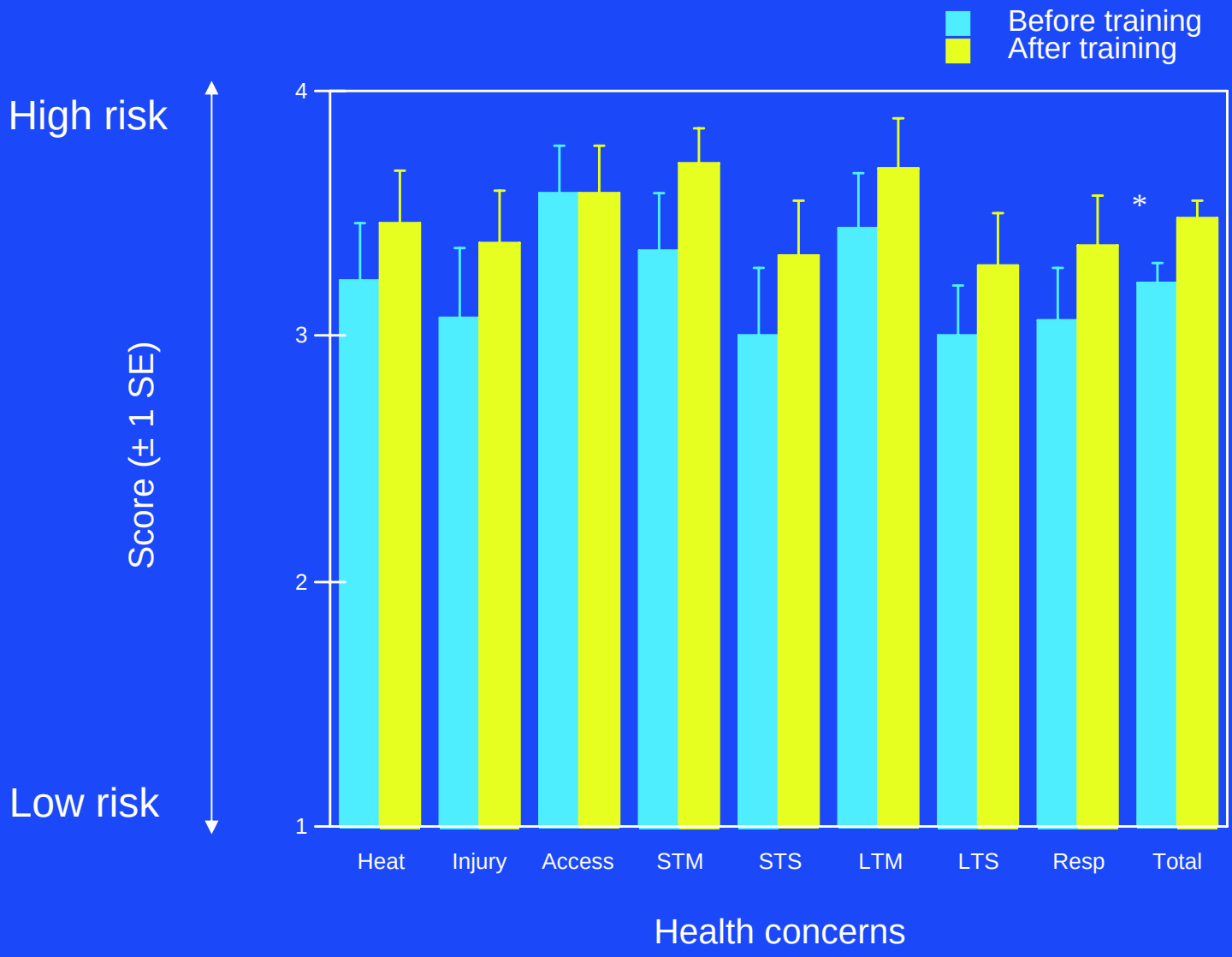


* P ≤ 0.05

Heat = Heat-related stress, PI= Personal Injury, Acc= Lack of access to emergency healthcare, STM= Short-term illness from mold, STS= Short-term illness from contaminated soil, LTM= Long-term illness from mold, LTS= Long-term illness from soil, Resp= Respiratory illness, Total= All categories combined

Question 1: Risk perception

Professional risk perception scores before and after training



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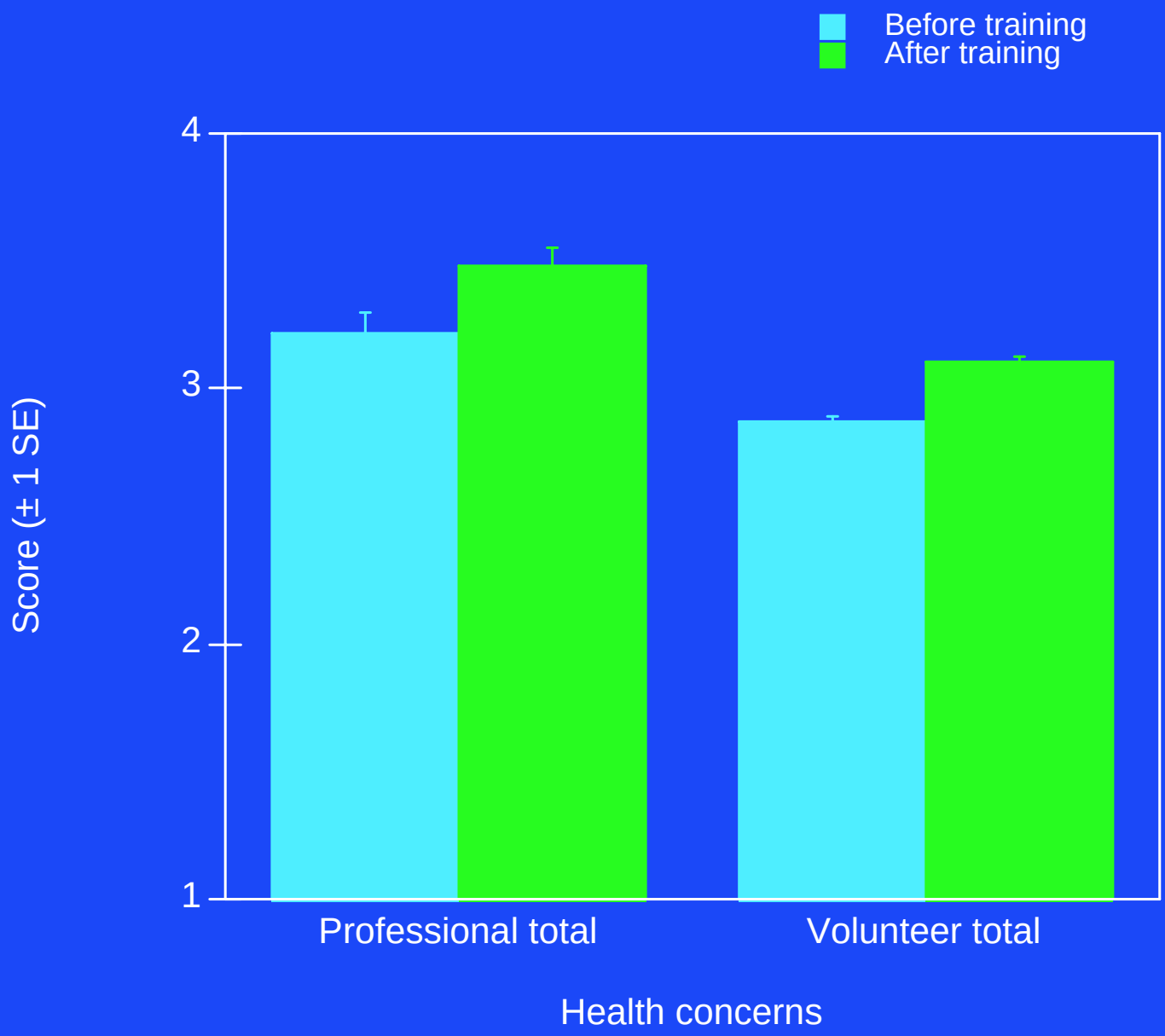
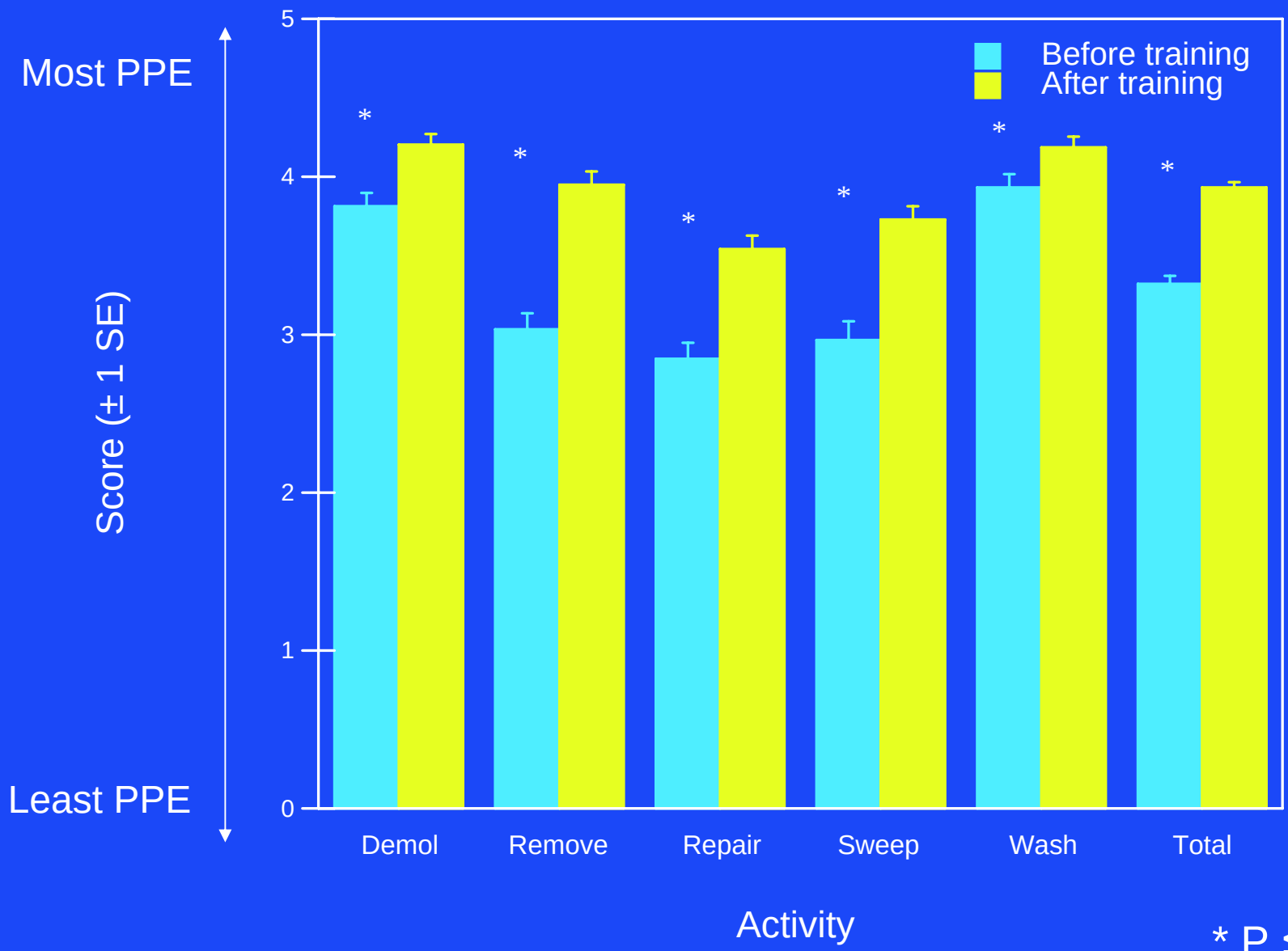
Professional vs. Volunteer total risk perception score change



Question 2: Anticipated PPE use

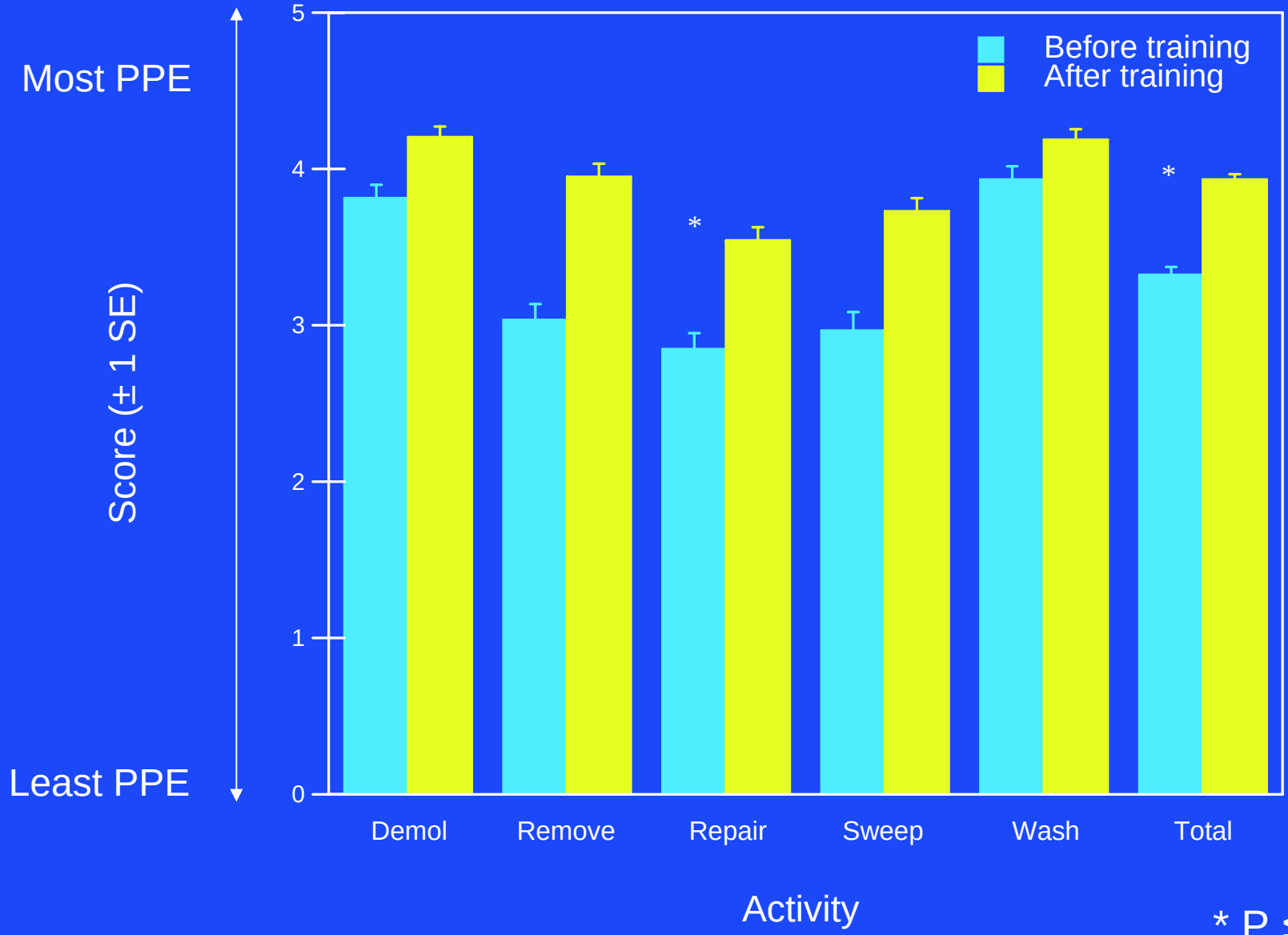
Volunteer anticipated PPE use score before and after training



* P ≤ 0.05

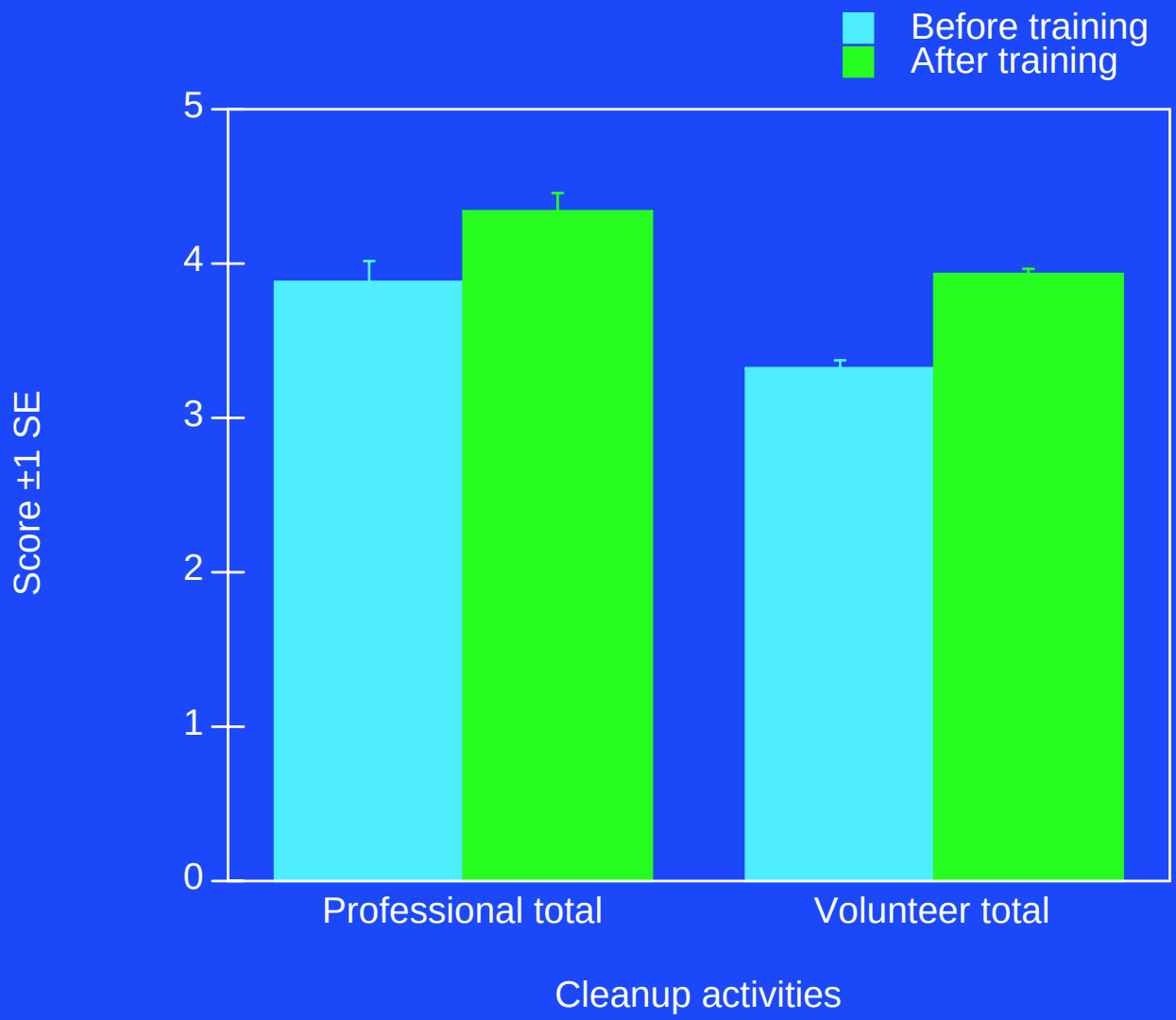
Question 2: Anticipated PPE use

Professional anticipated PPE use score before and after training

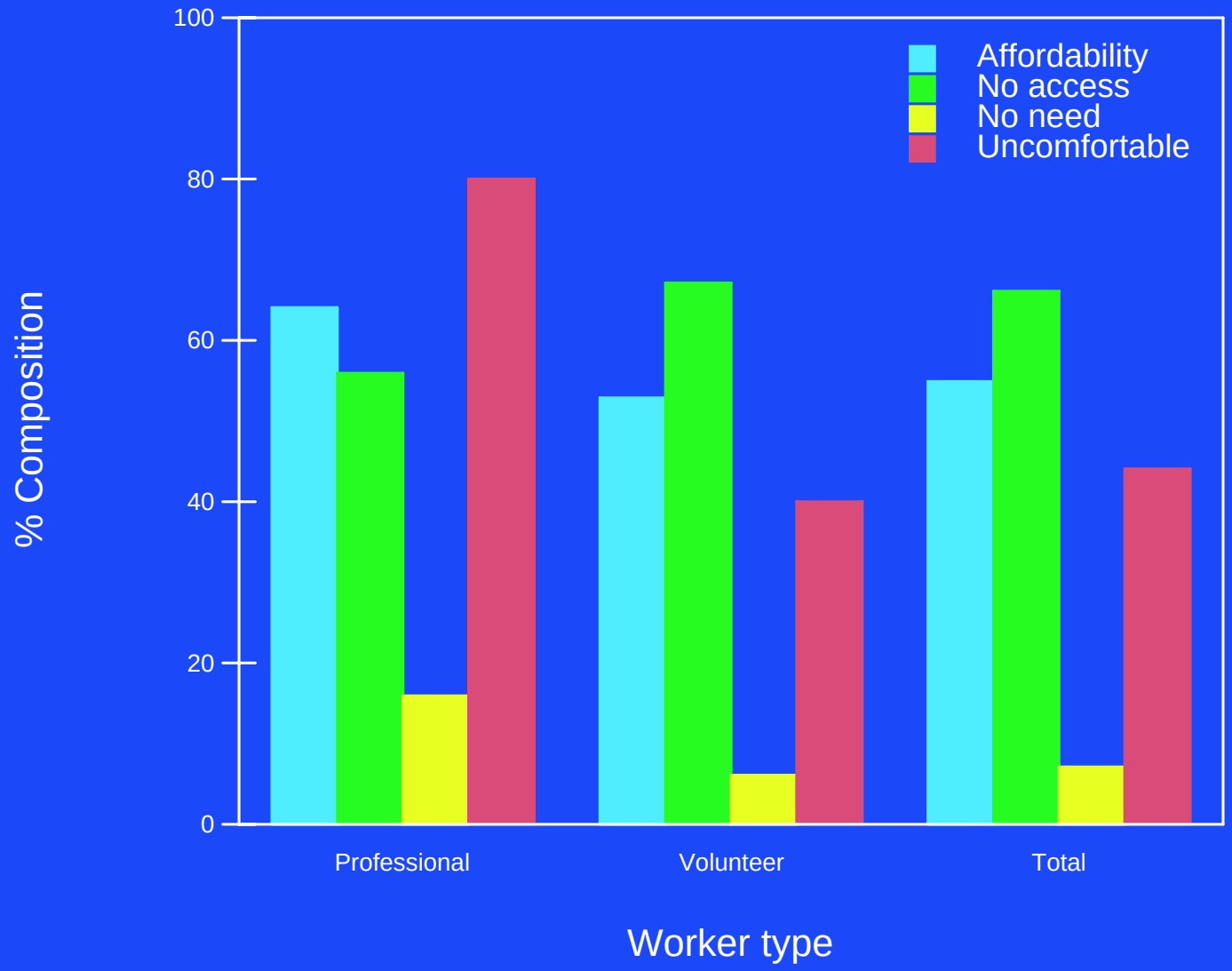


* P ≤ 0.05

Professional vs. Volunteer total anticipated PPE use score change



Question 3: Barriers to PPE use



Multivariate Models

Dependant variables

Model 1a:

Pre-training risk perception score

Model 1b:

Pre-training anticipated PPE use score

Model 2a:

Change in risk perception score

Model 2b:

Change in anticipated PPE use score

Model 3a:

Post-training risk perception score

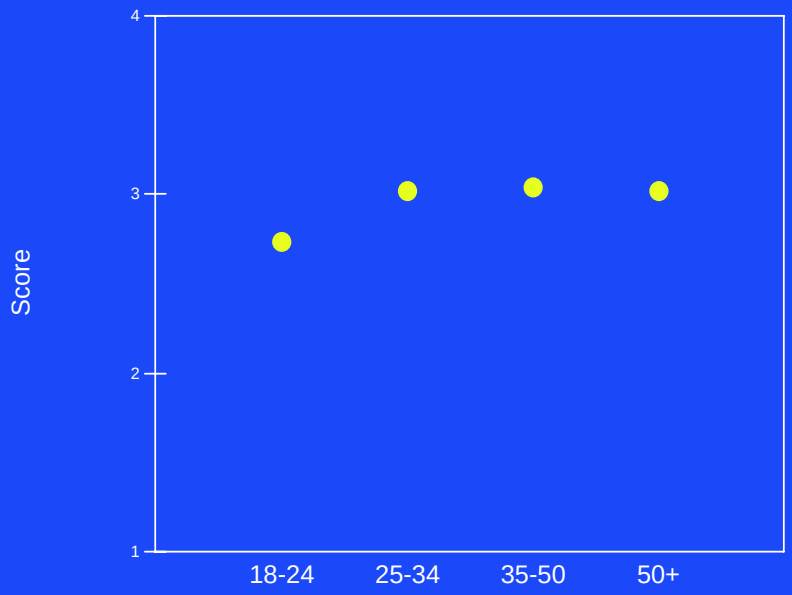
Model 3b:

Post-training anticipated PPE use score

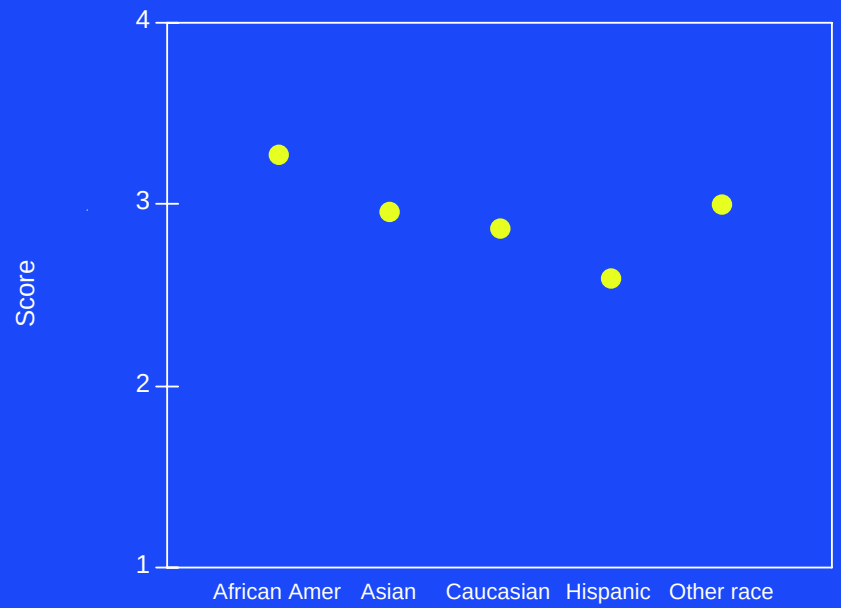
Independent variables

- Worker type
- Sex
- Age
- Race
- Education
- Occupation
- Marital status
- Children
- Live in affected region
- In New Orleans when Katrina hit
- Experienced other hurricane
- Previously participated in cleanup
- Ongoing health condition
- Baseline perception score (models 3a & 3b only)

Model 1a: Risk perception score before training



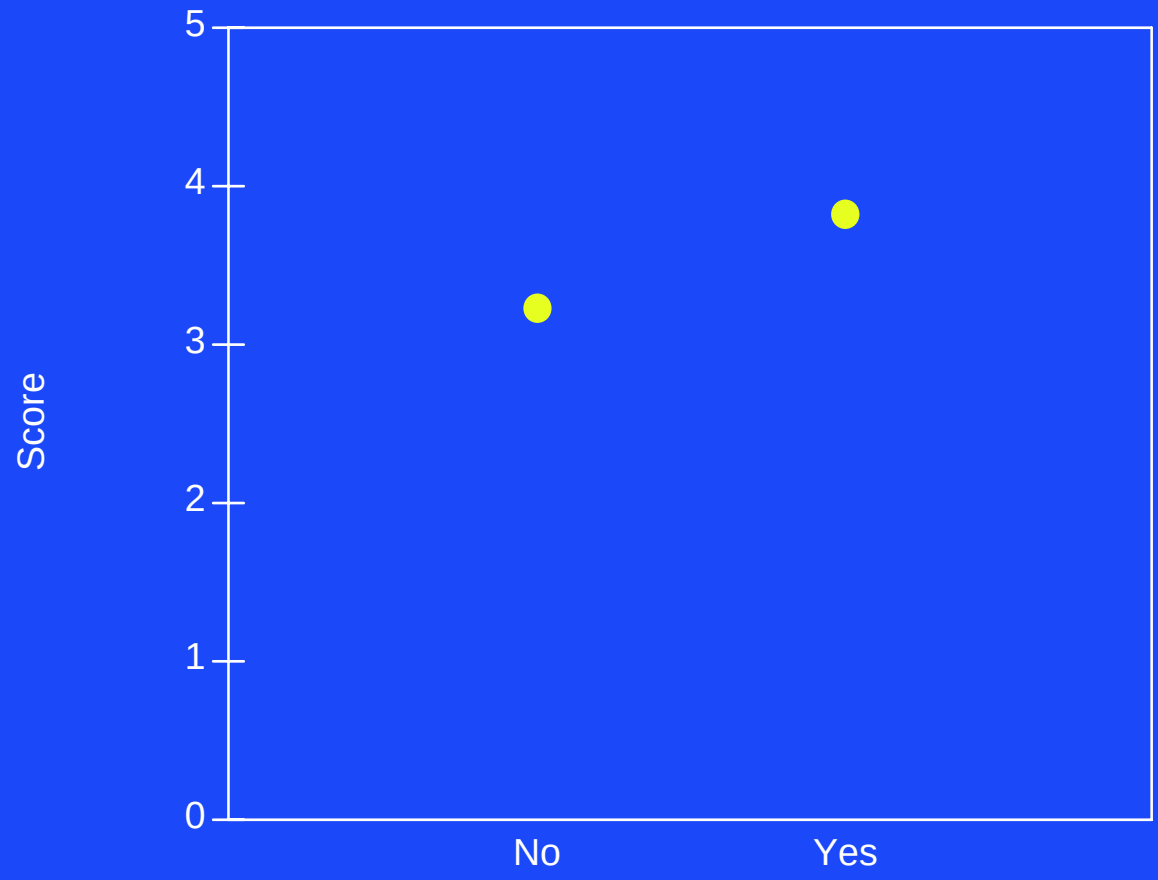
Age



Race

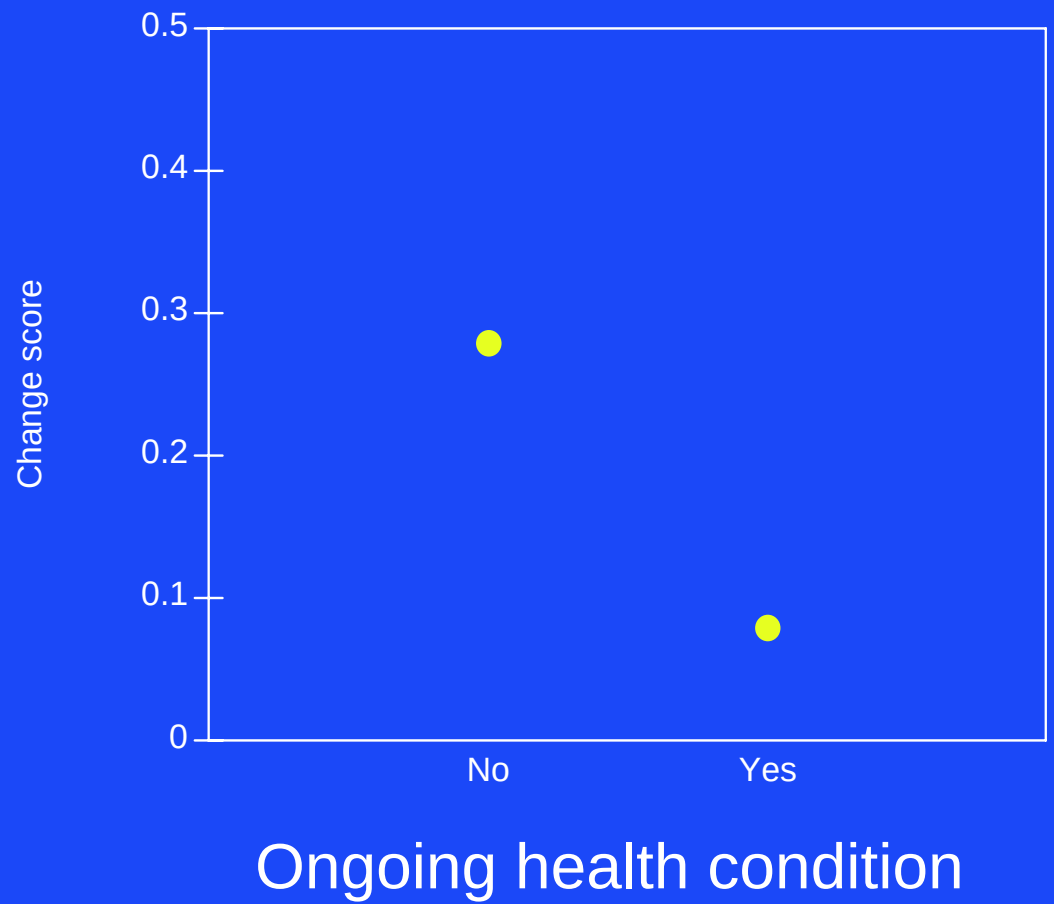
Controlling for: Experienced other hurricane

Model 1b: Anticipated PPE use score before training

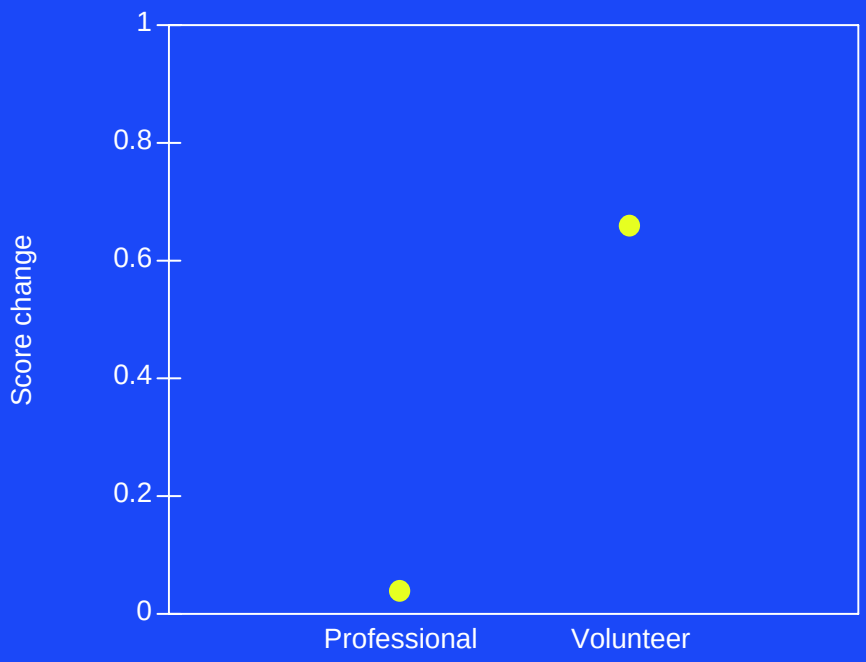


Controlling for: participated in cleanup, lived in affected region, worker type

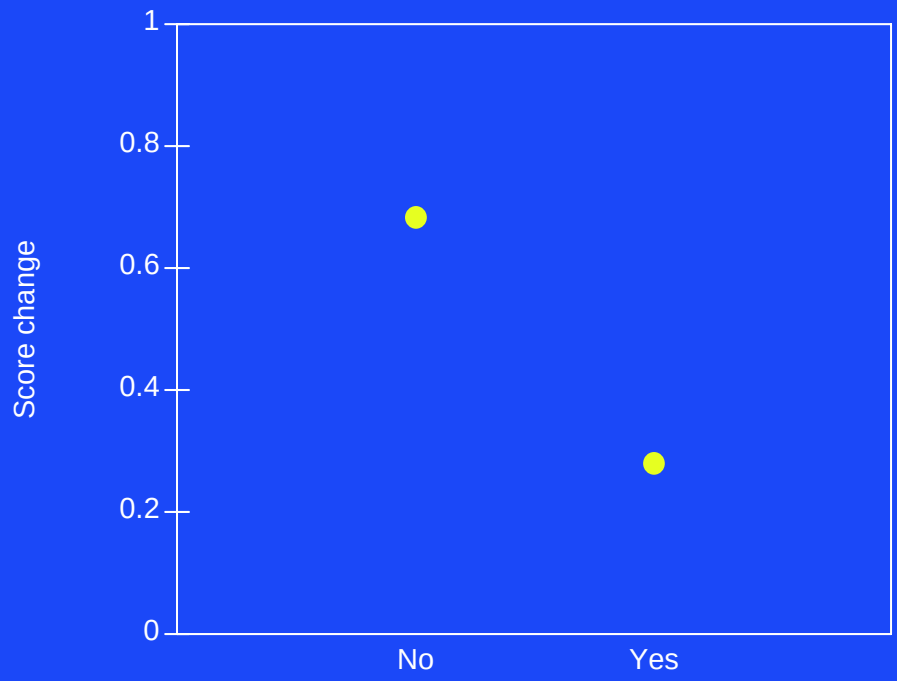
Model 2a: Change in risk perception score



Model 2b: Change in anticipated PPE use score



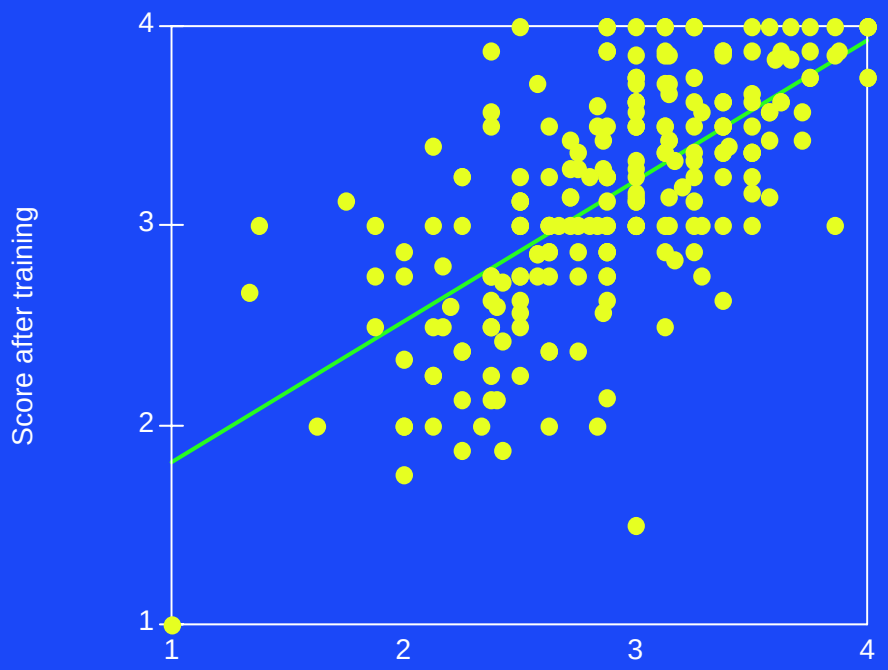
Worker type



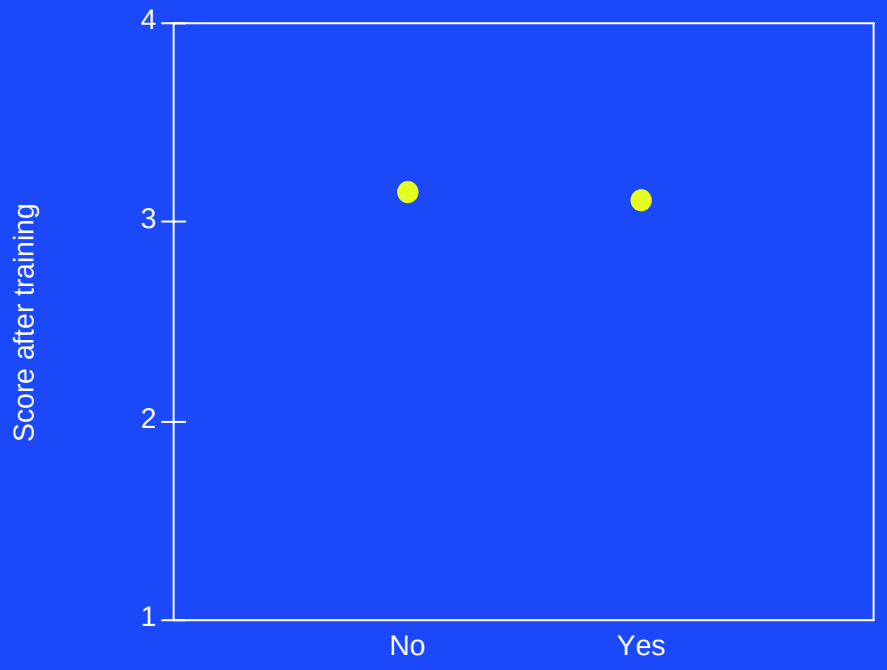
Ongoing health condition

Controlling for: Affected region

Model 3a: Risk perception score after training

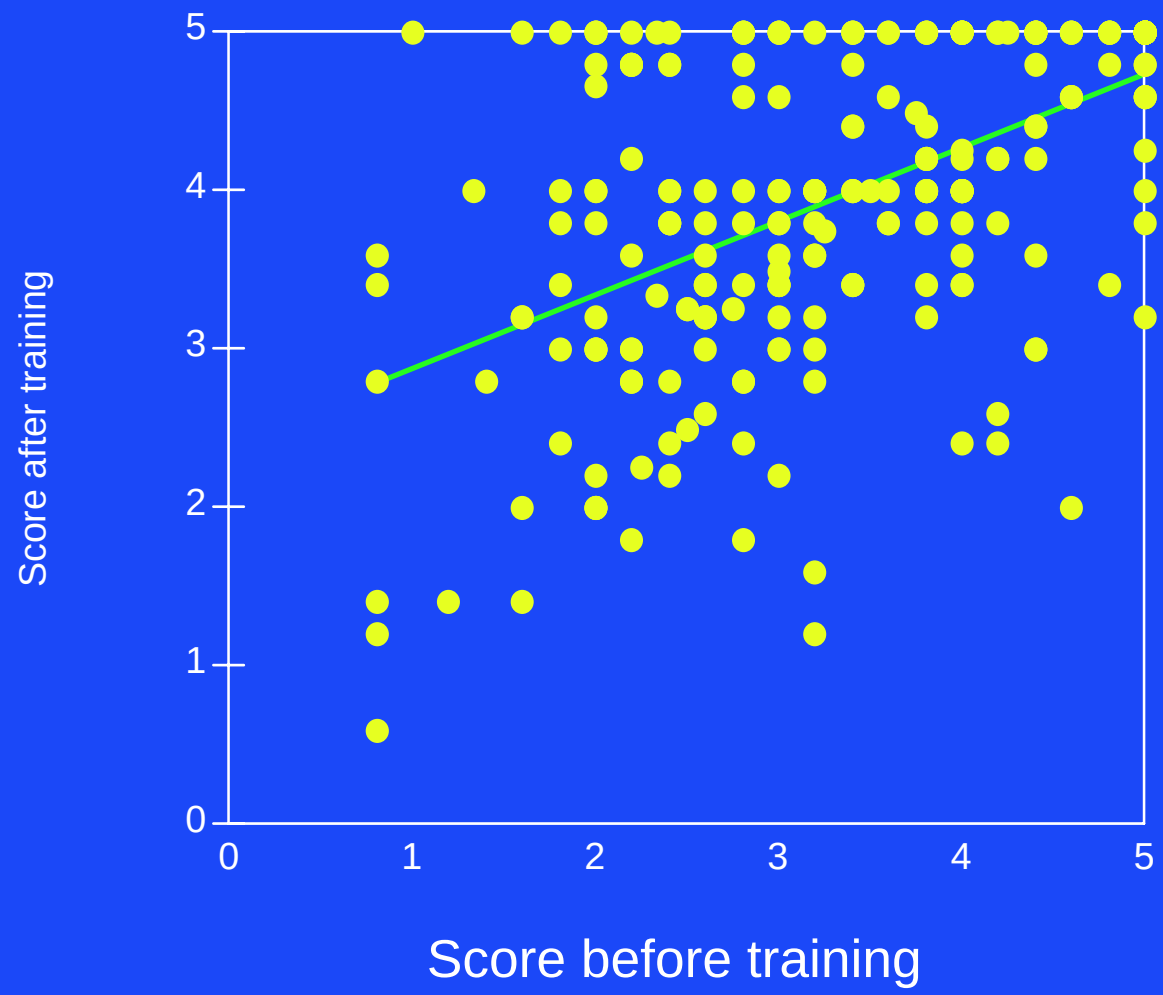


Score before training



Ongoing health condition

Model 3b: Anticipated PPE use score after training



Controlling for: Worker type, Age, Race

Summary of models

- Pre-training risk perception and anticipated PPE use are significantly associated with:
  - Age, Race, Ongoing health condition

- Post-training changes in risk perception and anticipated PPE use are significantly associated with:
  - Worker type, Ongoing health condition, pre-training risk perception and anticipated PPE use scores

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Study conclusions

- Trainings increase risk perception & anticipated PPE use in all workers
- Baseline perceptions important in predicting perceptions after training
- Ongoing health condition is a robust predictor of training effectiveness

Study strengths & Limitations

Strengths

- Information on poorly studied volunteer worker population

- Examines risk perception & anticipated PPE use together

- Models effect of training two different ways

Limitations

- Convenience sample
- Sample size
- No control population
- Non-uniform training curricula
- Inability for follow-up on behavior & health outcomes

Policy recommendations

- Broaden training availability
  - Even cursory training can be effective
- Community groups play effective role in health and safety training
- Adapt volunteer trainings
  - Standardization
  - Collect data on volunteers

Research Recommendations

- Link between:
  - Vulnerability & perceptions
  - Information sources & perceptions
- Consistent training curricula
- Worker follow-up

A big thank you

- My Committee: Rachel Morello-Frosch, Phil Brown, Andrew Artenstein
- Support network: CES graduate students, faculty, staff, and Jim
- Research Inspiration: Johanna Congleton & Rob Maestrett (PSR), Katrina workgroup (Brown), Gina Solomon (NRDC)
- Other contributors

Multivariate Models

Risk perception score & anticipated PPE use score

Baseline scores (before training)

- Score before training = Worker characteristics
- Score before training = $\alpha + \beta_1 (x_1) + \beta_2 (x_2) + \ldots \beta_n (x_n) + \square$

Training effectiveness

Model 1:

- Change score (After -before training)= Worker characteristics
- Change score= $\alpha + \beta_1 (x_1) + \beta_2 (x_2) + \ldots \beta_n (x_n) + \square$

Model 2:

- Score after training= Baseline score + Worker characteristics
- Score after training= $\alpha + \beta_1 (x_1) + \beta_2 (x_2) + \ldots \beta_n (x_n) + \square$

Models: baseline scores

Model A: Risk perception before training

Characteristic	Beta estimate	Pr >|t|
Ages 25-34	+	*
Ages 35-50	+	**
Ages 50+	+	*
Asian	-	
Caucasian	-	**
Hispanic	-	**
Other race	-	
Previous experience with hurricanes	+	~

R^2= 0.106, F= 4.107

Model B: Anticipated PPE use before training

Characteristic	Beta estimate	Pr >|t|
Previous health condition	+	***
Participated in cleanup	+	
Region not affected by Katrina	+	**
Volunteer worker	-	*

R^2= 0.082, F= 5.868

P<0.001 *** P<0.01 ** P<0.05 * P<0.10 ~

Effect of training: Model 1

Model A: Change in risk perception score

Characteristic	Beta estimate	Pr >|t|
Health condition	-	*

R^2= 0.024, F= 6.157

Model B: Change in anticipated PPE use score

Characteristic	Beta estimate	Pr >|t|
Volunteer worker	+	***
Region not affected by Katrina	-	**
Previous health condition	-	*

R^2= 0.069, F= 6.445

P<0.001 *** P<0.01 ** P<0.05 * P<0.10 ~

Effect of training: Model 2

Model A: Risk perception after training

Characteristic	Beta estimate	Pr >|t|
Pre-training risk perception score	+	***
Previous health condition	-	*

R^2= 0.412, F= 74.57

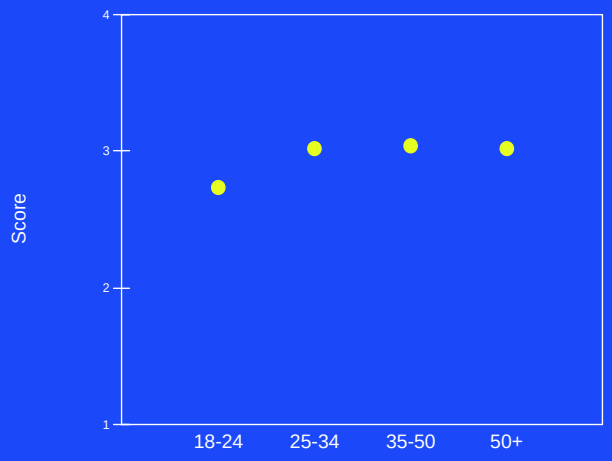
Model B: Anticipated PPE use after training

Characteristic	Beta estimate	Pr(>|t|)
Pre-training expected PPE use score	+	***
Volunteer worker	+	*
Ages 25-34	+	
Ages 35-50	+	*
Ages 50+	-	
Asian	-	
Caucasian	-	
Hispanic	+	
Other race	+	

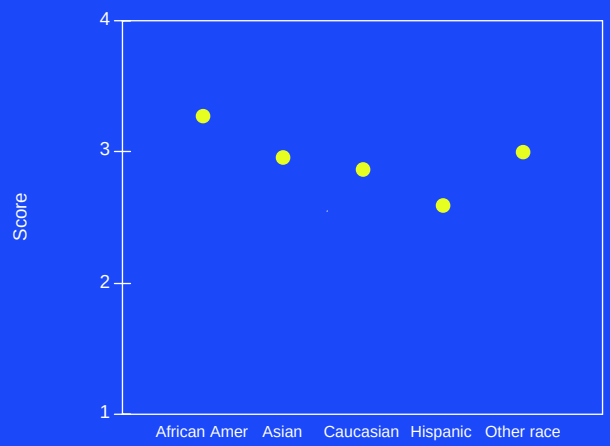
R^2= 0.300, F= 11.44

P<0.001 *** P<0.01 ** P<0.05 * P<0.10 ~

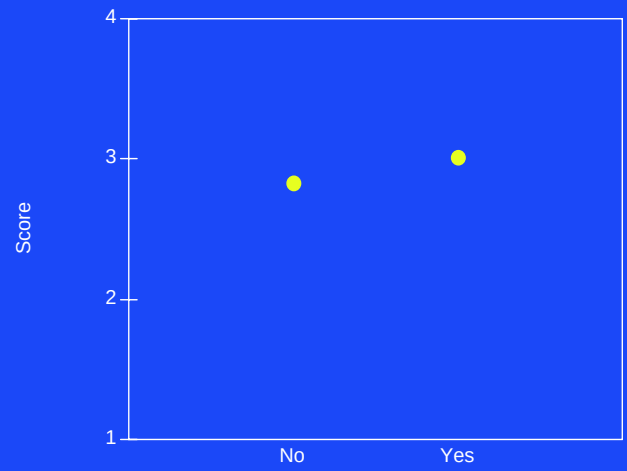
Baseline risk perception score



Age

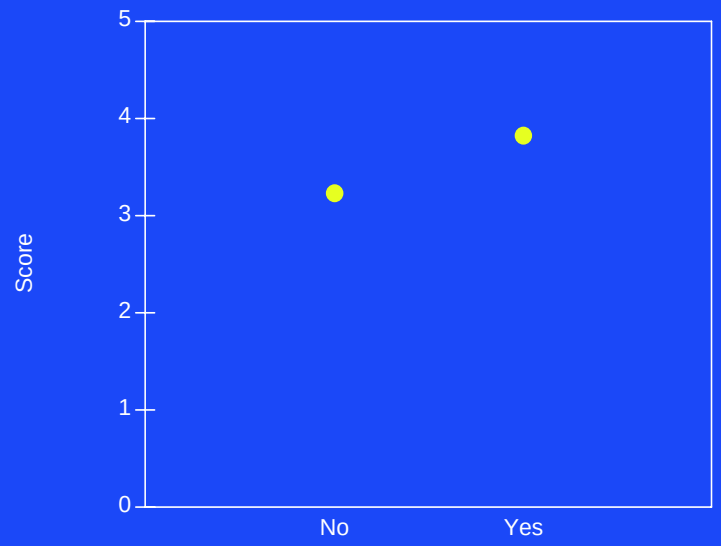


Race

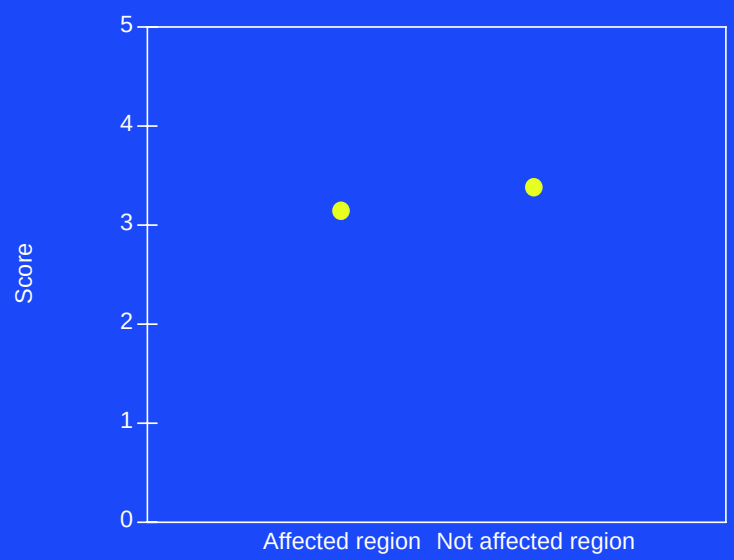


Experienced a hurricane

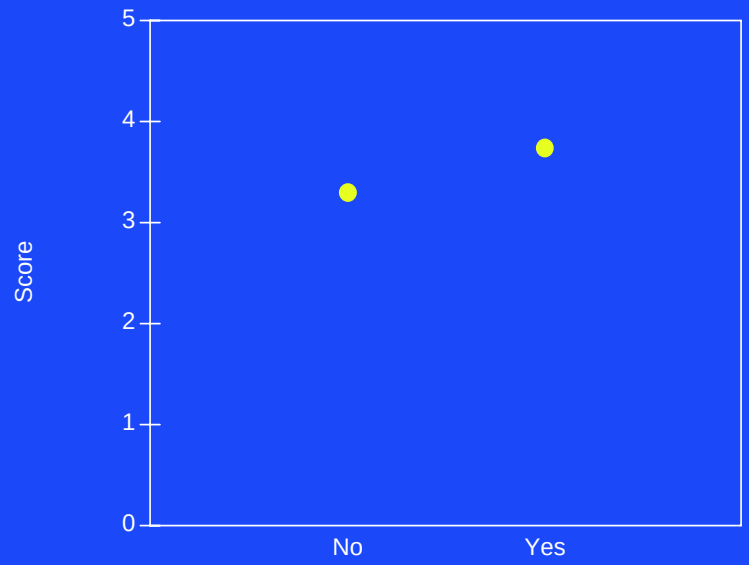
Baseline anticipated PPE use score



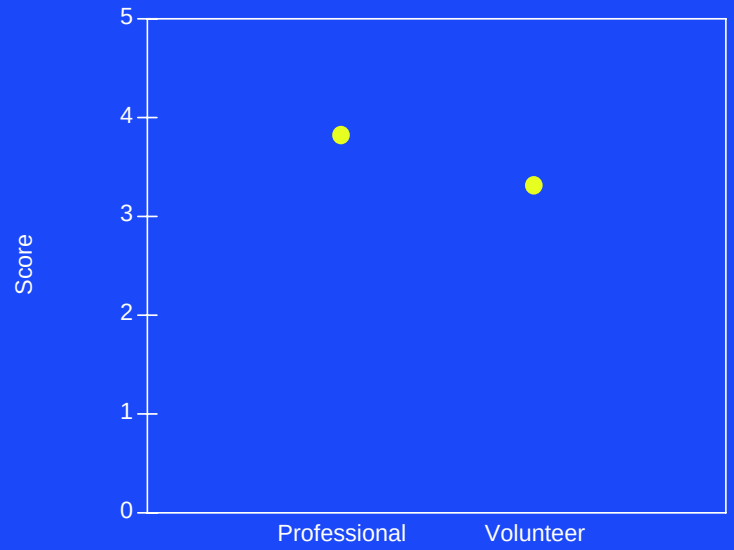
Ongoing health condition



Affected region

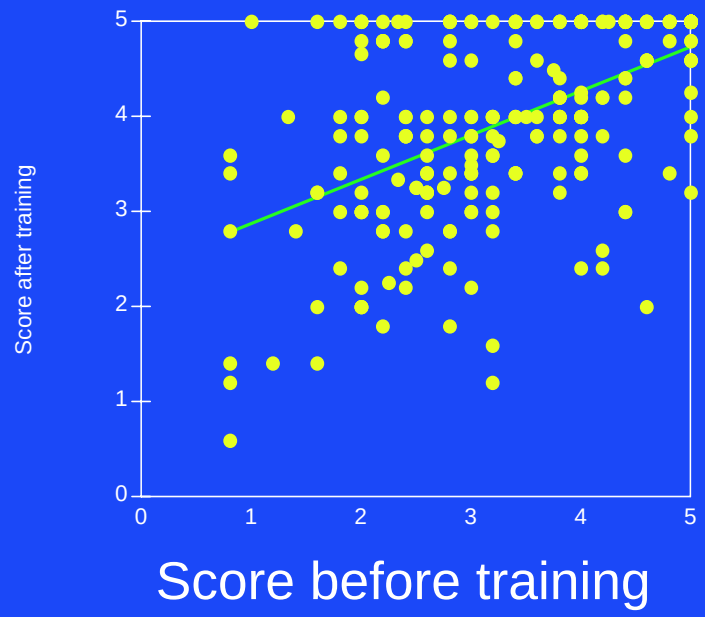


Participated in cleanup

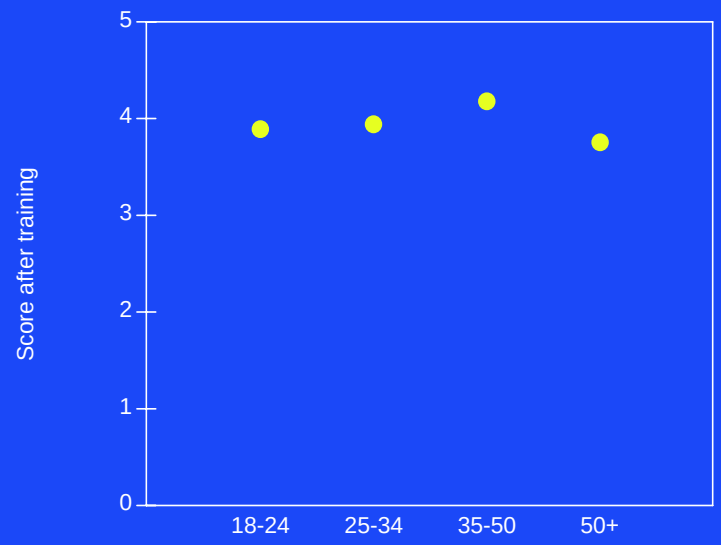


Worker type

Anticipated PPE use score after training



Score before training



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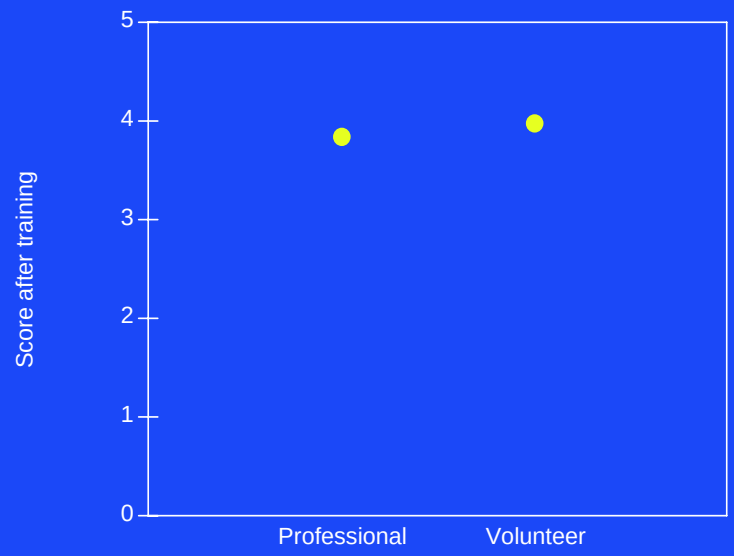
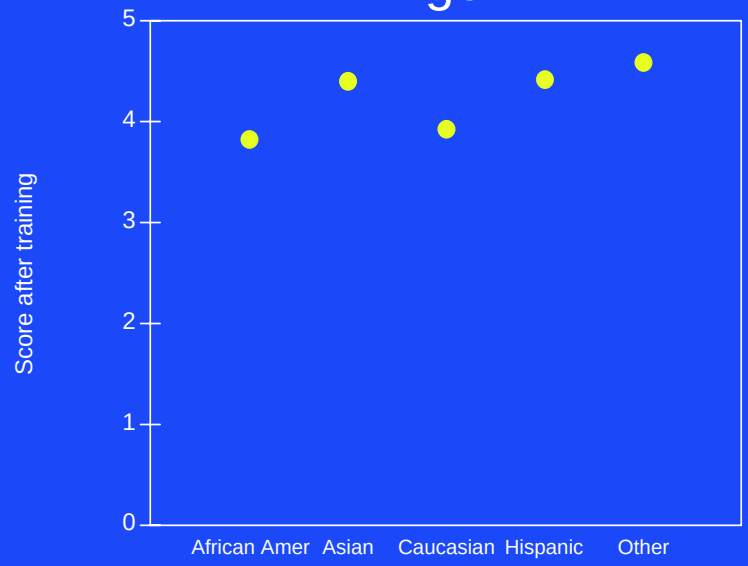


Worker type



Race