Perceptual Face Abilities of Face Examiners for Varying Tasks

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National Institute of Standards and Technology
U.S. Department of Commerce

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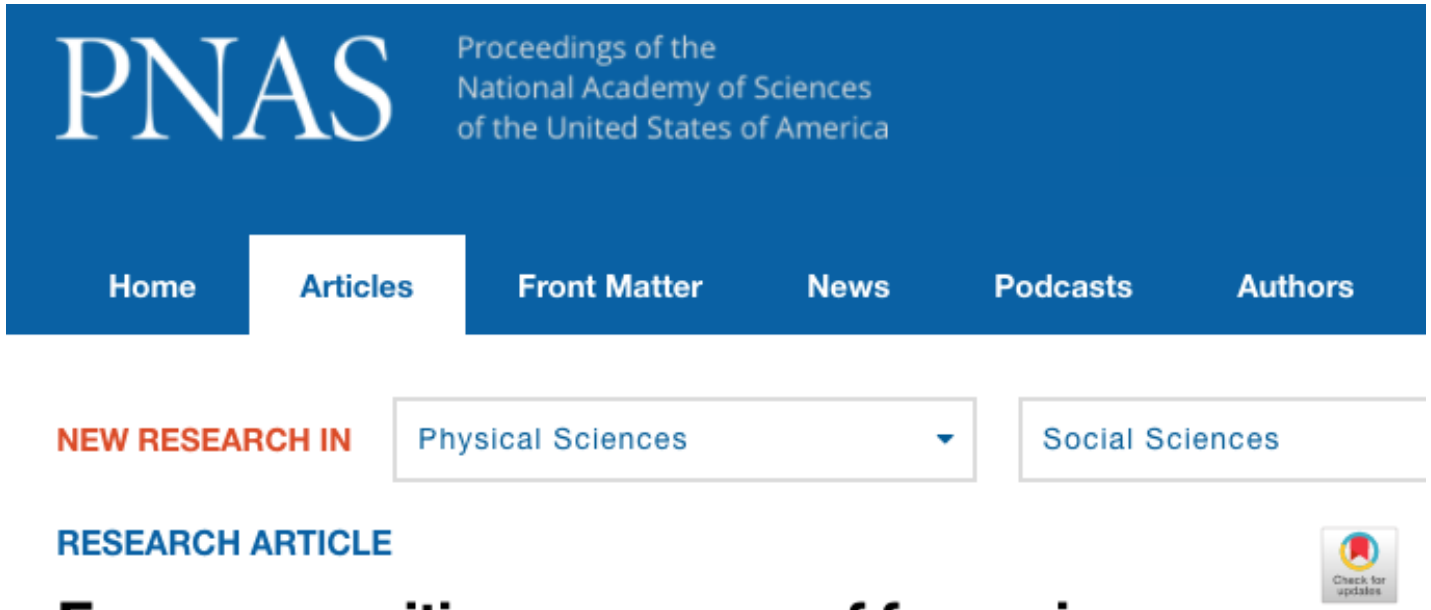
Outline

- Brief Backstory
- Current Study
- Across Races
- Face Memory
- Disguised Faces

A Brief Backstory

Proceedings of National Academy of Sciences



General Rules

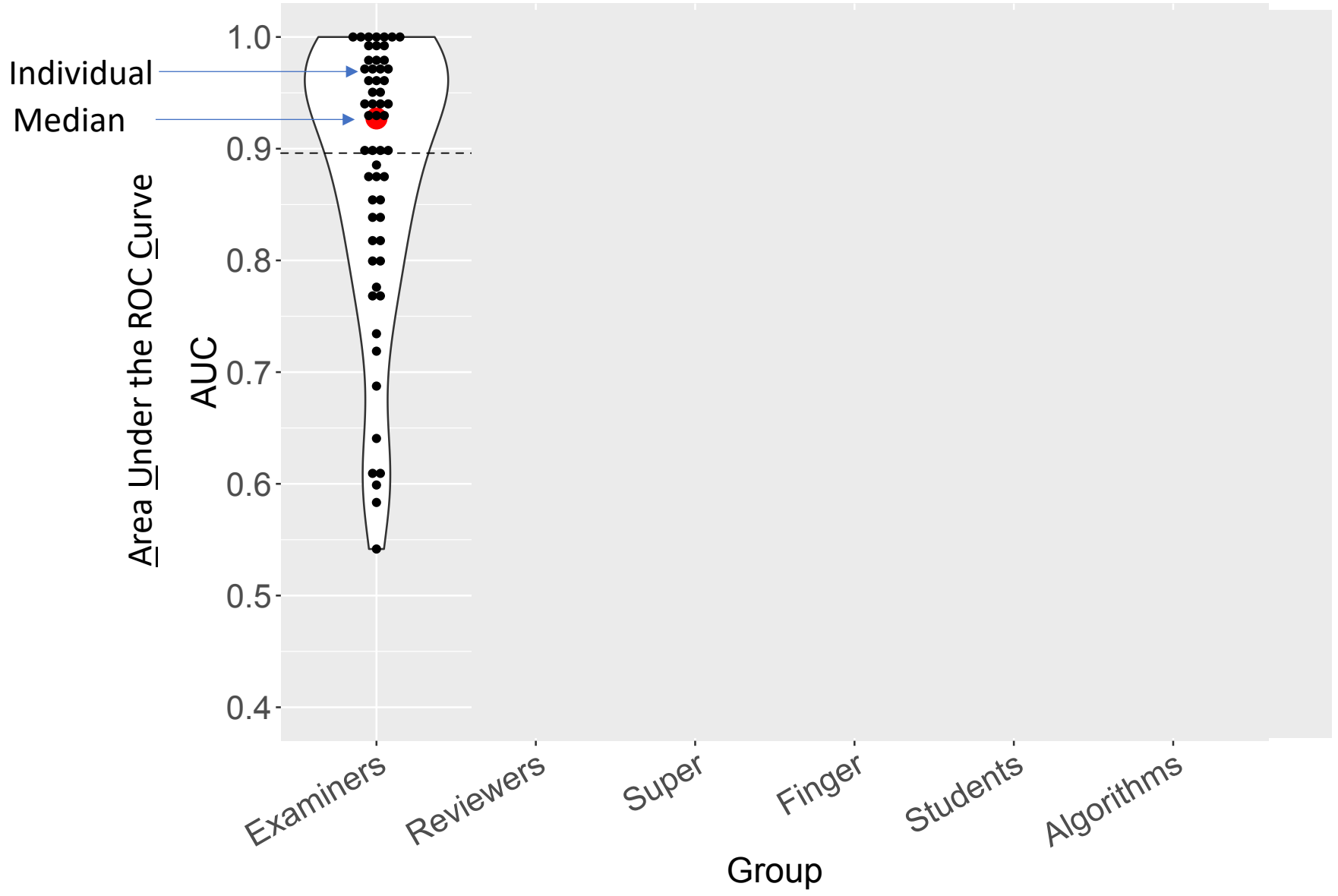
- Administered remotely
- Examiners could use their tools and methods
- 20 pairs of face images
- 3 months to complete comparisons

Example of Image Pairs

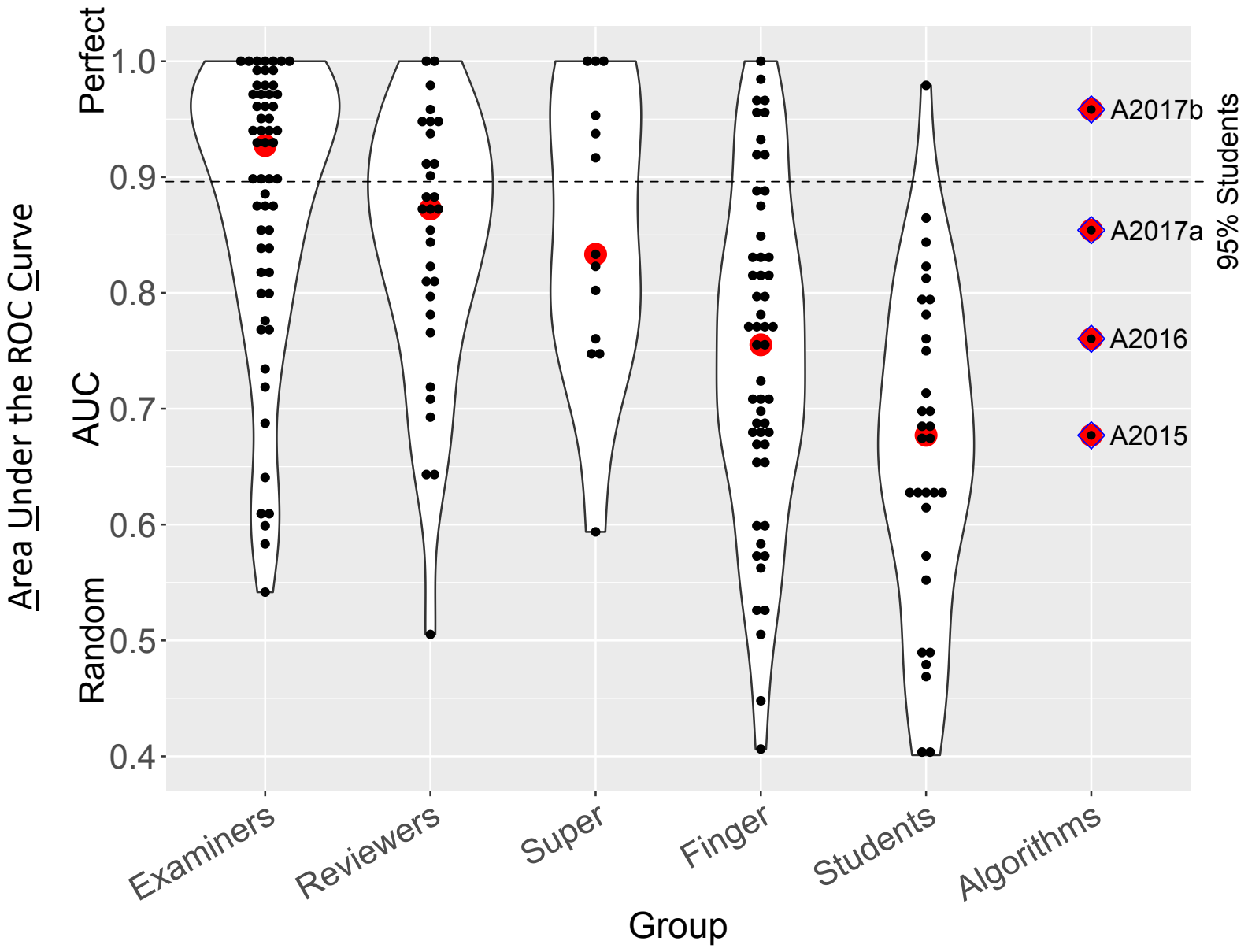
Same-identity pair

Different-identity pair

Comparison Across Groups



Comparison Across Groups



PNAS Conclusions

- Facial examiners are significantly better than the general population

- No statistical difference among examiners, reviewers, and super-recognizers.
- Best algorithm is competitive with best humans
- Fusing human judgements is effective
- Performance optimized by fusing one facial examiner and A2017b.

Current Perceptual Study

- Investigate extent of examiners' ability
  - Multiple tests investigating different areas
  - Perceptual tests (limited time, no tools or methods)
- Faces of different races
- Face memory
- Disguised faces

- Examiners: over web or on NIST laptop
- Students: University of Texas at Dallas

Black Box Road Map

1. Perceptual test with students

2. Perceptual test with face professionals (e.g., face examiners)[1]

3. Black box test

[1]D. White, P.J. Phillips, C.A. Hahn, M. Hill, and A.J. O'Toole, "Perceptual expertise in forensic facial image comparison," *Proceedings of the Royal Society B*, 282(1814), 2015.

DOI: 10.1098/rspb.2015.1292

Black Box Road Map

1. Perceptual test with students

2. Perceptual test with face professionals (e.g., face examiners)

3. Black box test

Performance Across Races

Why across races?

The other race effect (ORE) is when it is easier to recognize faces of one's own race than it is to recognize faces of a different race.

It is important to know how well face examiners perform across different races.

Test based on imagery in Phillips *et al.* (2011)[2], contains equal sets of Caucasian and East Asian faces.

[2]P. J. Phillips, F. Jiang, A. Narvekar, J. Ayyad, and A. J. O'Toole, "An other-race effect for face recognition algorithms," *ACM Trans. Appl. Percept.*, vol. 8, Feb. 2011. DOI: 10.1145/1870076.1870082

Example Image Pairs

+2 : Sure they are the same
+1 : Think they are the same
0 : Do not know
-1 : Think they are not the same
-2 : Sure they are not the same

Same Identity

Example Image Pairs

Different Identities

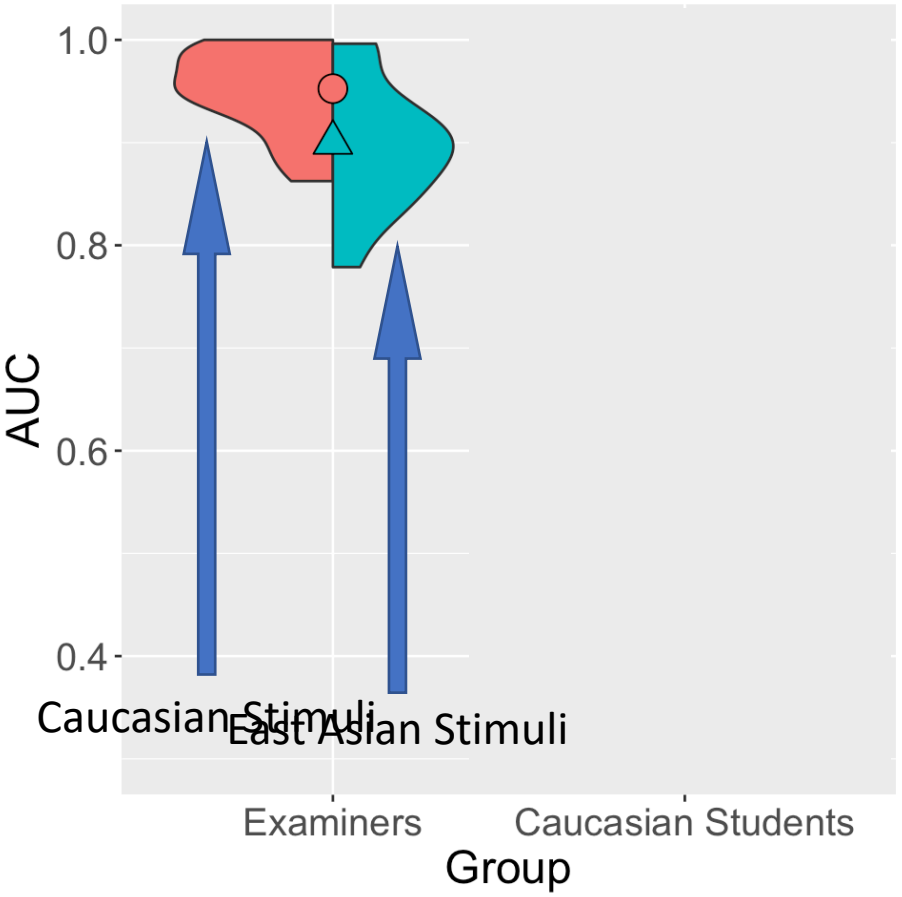
+2 : Sure they are the same
+1 : Think they are the same
0 : Do not know
-1 : Think they are not the same
-2 : Sure they are not the same

Cross-Race Test

- 80 pairs of face images
  - Caucasian faces
  - East Asian faces
- Up to 30 seconds to view each pair

- 14 Examiners (Caucasian ancestry)
- 48 Caucasian Students

Both Stimuli Sets



Caucasian Stimuli

- **Examiners > Caucasian Students (*p*=0.00123**)**

East Asian Stimuli

- **Examiners = Caucasian Students (*p*=0.123)**

Cambridge Face Memory Test (CFMT+)

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Why memory?

Face examiners are trained in performing detailed, scientific facial comparisons.

It is important to know if face examiners' skills are specific to comparisons or if they possess superior ability in general face tasks.

The long form of the Cambridge Face Memory Test (CFMT+)[3] measures the ability of participants face memory and includes items designed to measure high ability performers.

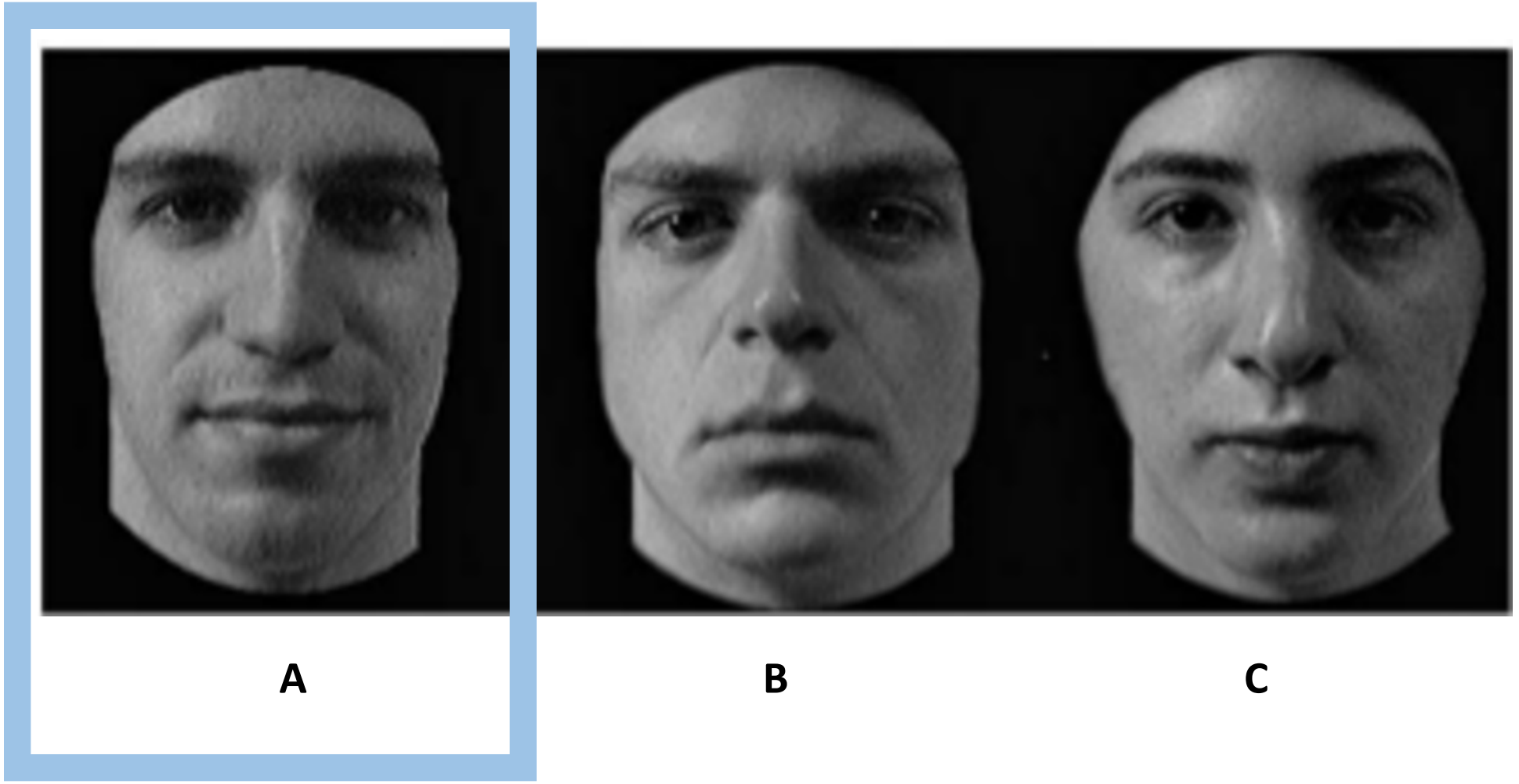
[3]R. Russell, B. Duchaine, and K. Nakayama, "Super-recognizers: People with extraordinary face recognition ability," *Psychonomic Bulletin & Review*, vol. 16, pp. 252—257, 2009. DOI: 10.3758/PBR.16.2.252

Memorize

Memorize

Memorize

Which face did you just see?



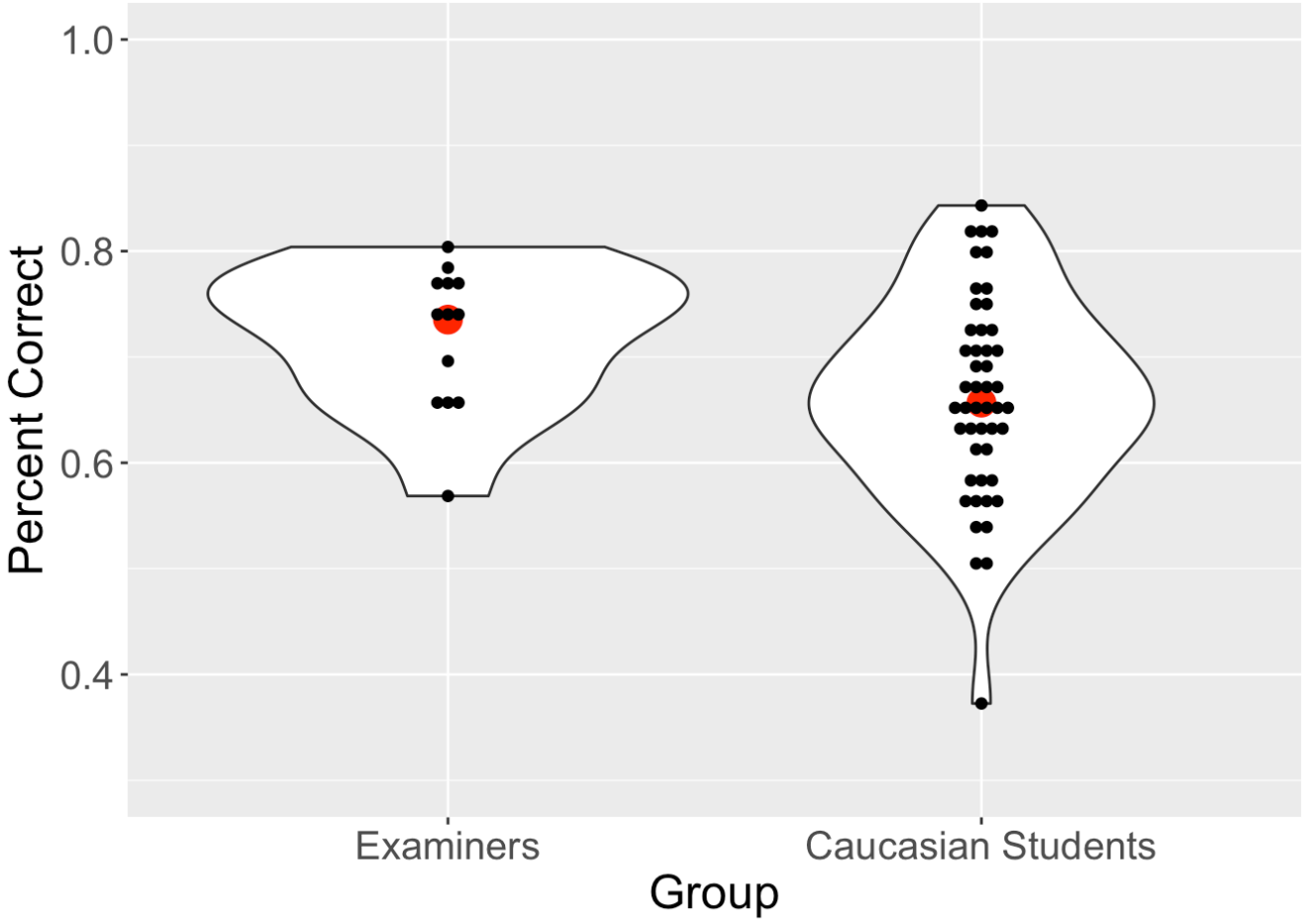
A B C

CFMT+

- 120 face trios

- 13 Examiners (not taken before)
- 48 Caucasian Students

Face Memory



- **Examiners > Caucasian Students (*p*=0.0329*)**

Disguised Faces

Why disguises?

Two ways to disguise oneself:

1. Evasion: alter appearance to not look as oneself

2. Impersonation: alter appearance to look like a specific other person

Test based on imagery from Noyes and Jenkins (2019)[4], containing images people disguised both ways.

[4]E. Noyes and R. Jenkins, “Deliberate disguise in face identification,” *Journal of Experimental Psychology: Applied*, vol. 25, pp. 280–290, 2019. DOI: 10.1037/xap0000213

Example Image Pairs

Evasion (Same Identity)

+2 : Sure they are the same
+1 : Think they are the same
0 : Do not know
-1 : Think they are not the same
-2 : Sure they are not the same

Example Image Pairs

Impersonation (Different Identities)

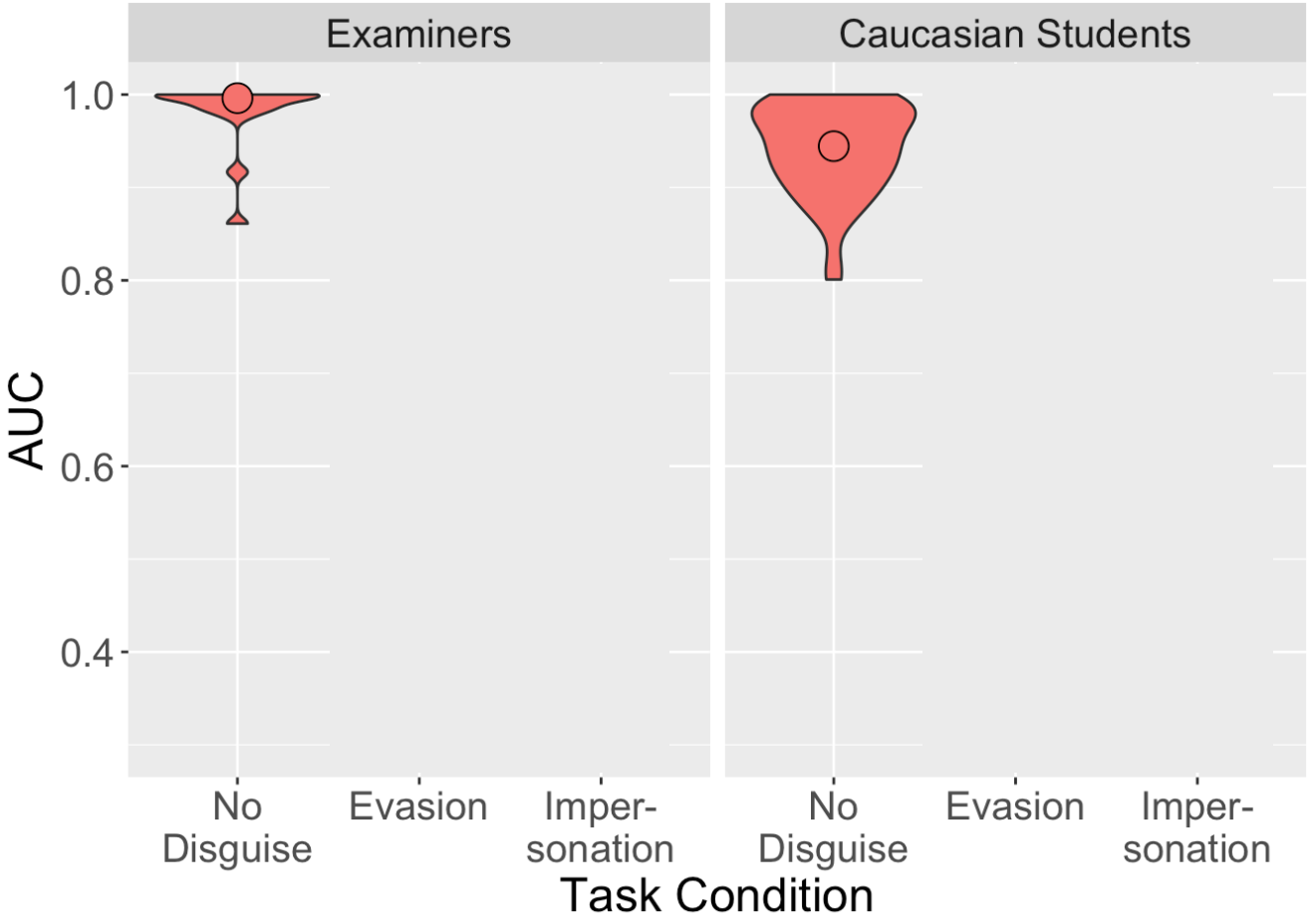
+2 : Sure they are the same
+1 : Think they are the same
0 : Do not know
-1 : Think they are not the same
-2 : Sure they are not the same

Façade Test

- 72 pairs over 3 conditions
  - No disguise: each person in the pair presents as themselves
  - Evasion: in same-identity pairs, person tries not to look like themselves
  - Impersonation: in different-identity pairs, person tries to look like another person
- Up to 30 seconds to view each pair

- 14 Examiners
- 48 Caucasian Students

All Conditions



No Disguise Condition

- **Examiners > Caucasian Students (*p*=0.00127**)**

Evasion Condition

- **Examiners = Caucasian Students (*p*=0.0652)**

Impersonation Condition

- **Examiners > Caucasian Students (*p*=0.00287**)**

Conclusions

- Perceptual tests
  - Limited time
  - No tools or methods
  - Black box needed
- Cross-Race Comparisons
  - Caucasian stimuli: examiners better than Caucasian students
  - East Asian stimuli: examiners equal to Caucasian students
- Face Memory
  - Examiners better than Caucasian students
- Disguised Faces
  - No disguise: examiners better than Caucasian students
  - Evasion: examiners equal to Caucasian students
  - Impersonation: examiners better than Caucasian students

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- Face Memory
  - Examiners better than Caucasian students
- Disguised Faces
  - **No disguise: examiners better than Caucasian students**
  - Evasion: examiners equal to Caucasian students
  - Impersonation: examiners better than Caucasian students
- Deeper understanding of examiners' abilities

Thank you!