Accuracy of Facial Forensic Examiners and Super-Recognizers

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Human Accuracy on Hard Cases

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FEATURE

Humans vs machines: the future of facial recognition

Tim Ring

Tim Ring, journalist

London Metropolitan Police Commissioner Sir Bernard Hogan-Howe (left) presents the force's Staff of the Year award to 'super recogniser' Detention Officer Idris Bada.

Courtesy T. Ring, Biometric Technology Today, 2016

Outline

- Range of human accuracy
- Perceptual accuracy of facial forensic examiners
- Accuracy of super-recognizers
- Measure accuracy of facial forensic examiners in their milieu

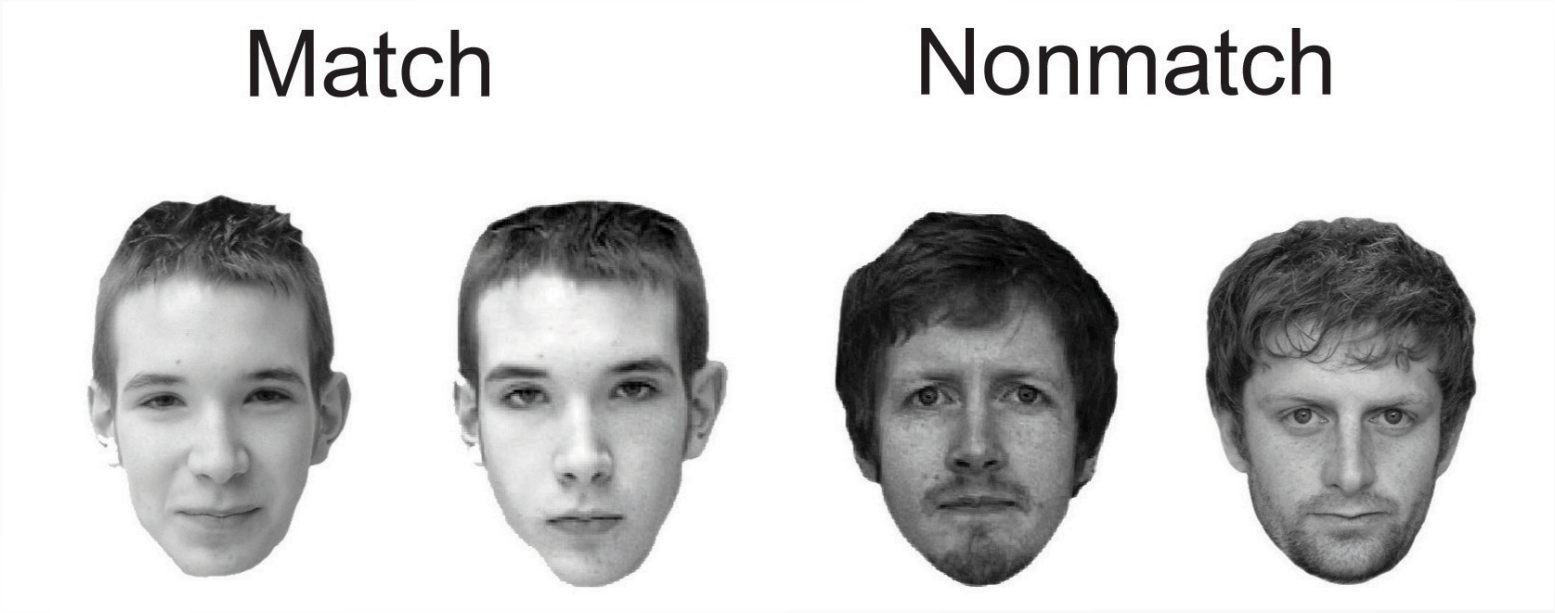
Facial Examiner vs Super-recognizer

- Two different scenarios

- Super-recognizers (The Met)
  - Familiar face recognition
  - From memory
  - Learned faces on their “beat”
- Facial Examiners
  - Unfamiliar face recognition
  - Compare faces side-by-side
  - Trained
  - Tools and methods

Glasgow Face Matching Test

Question: What is the range of human accuracy?



Same or different?

Burton, White & McNeill (2010). *Behavior Research Methods,* 42, 286-291.

Range of Accuracy on GFMT

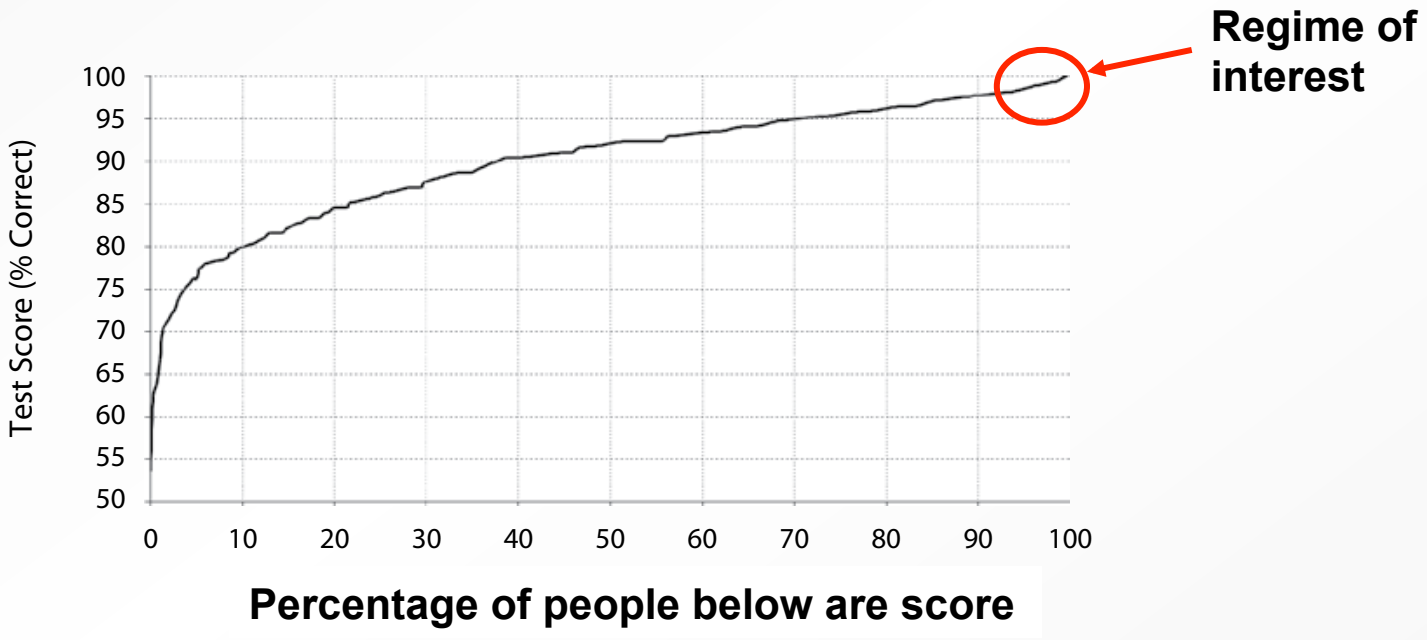


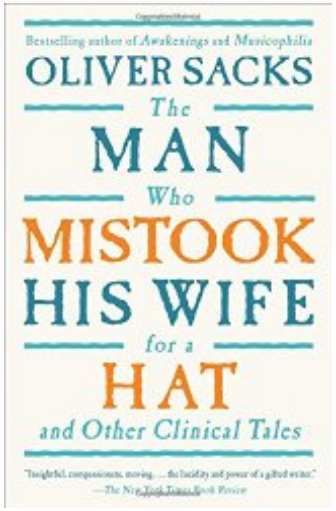
Figure 2. Cumulative frequency of accuracies for the Glasgow Face Matching Test.

Burton, White & McNeill (2010). *Behavior Research Methods,* 42, 286-291.

Two Dimensions of Recognition

Perceptual

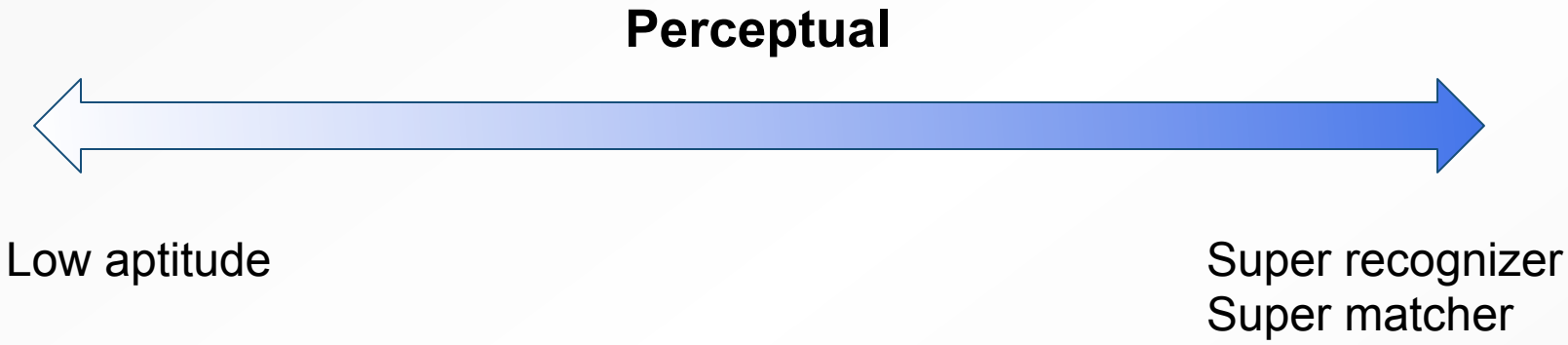
Low aptitude



Super recognizer
Super matcher

London Metropolitan Police Commissioner Sir Bernard Hogan-Howe (left) presents the force's Staff of the Year award to 'super recogniser' Detention Officer Idris Bada.

Two Dimensions of Recognition



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Research

CrossMark click for updates

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Perceptual expertise in forensic facial image comparison

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Forensic facial identification examiners are required to match the identity of faces in images that vary substantially, owing to changes in viewing conditions and in a person's appearance. These identifications affect the course and outcome of criminal investigations and convictions. Despite calls for research on

- **Thanks**
  - **Dr. Richard Vorder Bruegge**
  - **FISWG**

Two Dimensions of Recognition

Perceptual

Low aptitude

Super recognizer
Super matcher

Training

No training

Forensic expert

Motivation and Goals

- Motivation
  - Forensic 1-to-1 Comparison
    - Testify in court
  - Meet Daubert criteria (US legal system)
- Goals
  - Performance of forensic examiners
    - Comparison to population

Perceptual Test

- Human subject raters respond…
  - 1. sure they are the same person
  - 2. think they are the same person
  - 3. not sure
  - 4. think they are not the same person
  - 5. sure they are not the same person

Questions Asked

- Are forensic examiners better than the general population?
- Does time looking at a face matter?
- Do examiners look at more than the face?
- Do examiners recognize faces differently?

Basics

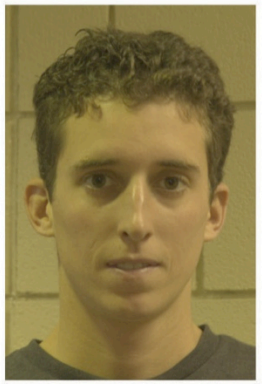
- 6 May 2014 Facial Identification Scientific Working Group Meeting, Quantico VA
  - 27 Examiners (international group)
  - 14 Non-examiners (controls)
- UNSW
  - 32 Student volunteers (students)

Three Tests — Six Tasks

- Glasgow Face Matching Test
- Expertise in Facial Comparison Test
  - 2 second and 30 second exposure time
  - Upright and inverted faces
- Person Identification Test

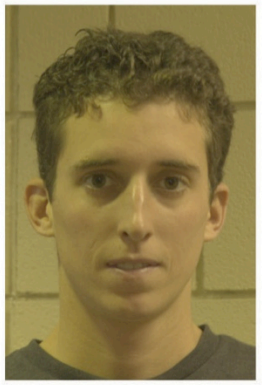
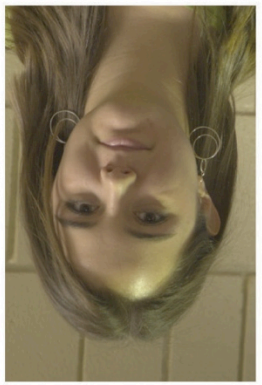
Expertise in Facial Comparison Test

Question: Does time looking at a face matter?

	Match		Non-match	
Upright **2 Sec & 30 Sec**				

Expertise in Facial Comparison Test

Question: Do examiners process faces differently?

	Match		Non-match	
Upright 2 Sec & 30 Sec				
Inverted 2 Sec & 30 Sec				

Creation of Expertise in Facial Comparison Test

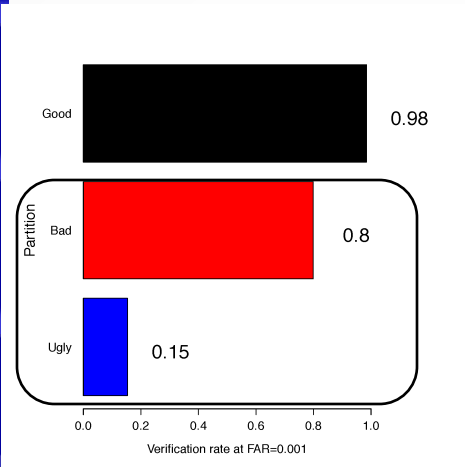
Stratification By Algorithms

Select

Student Human Performance

Select

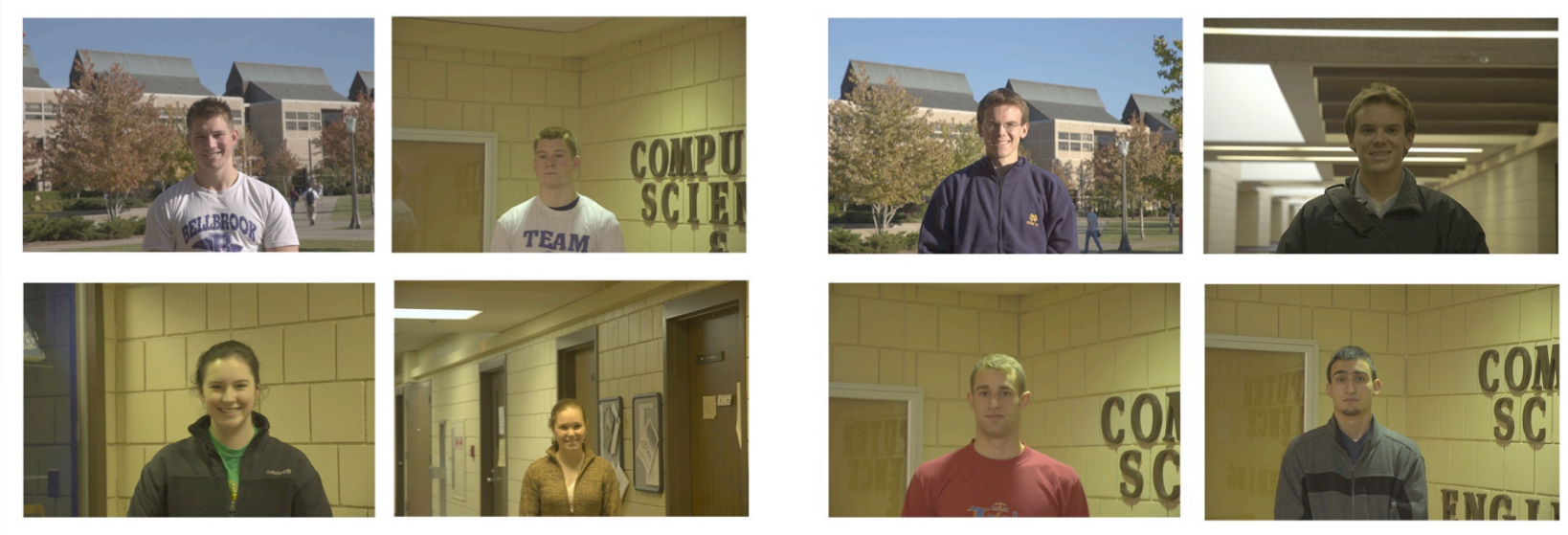
Image pairs for EFCT



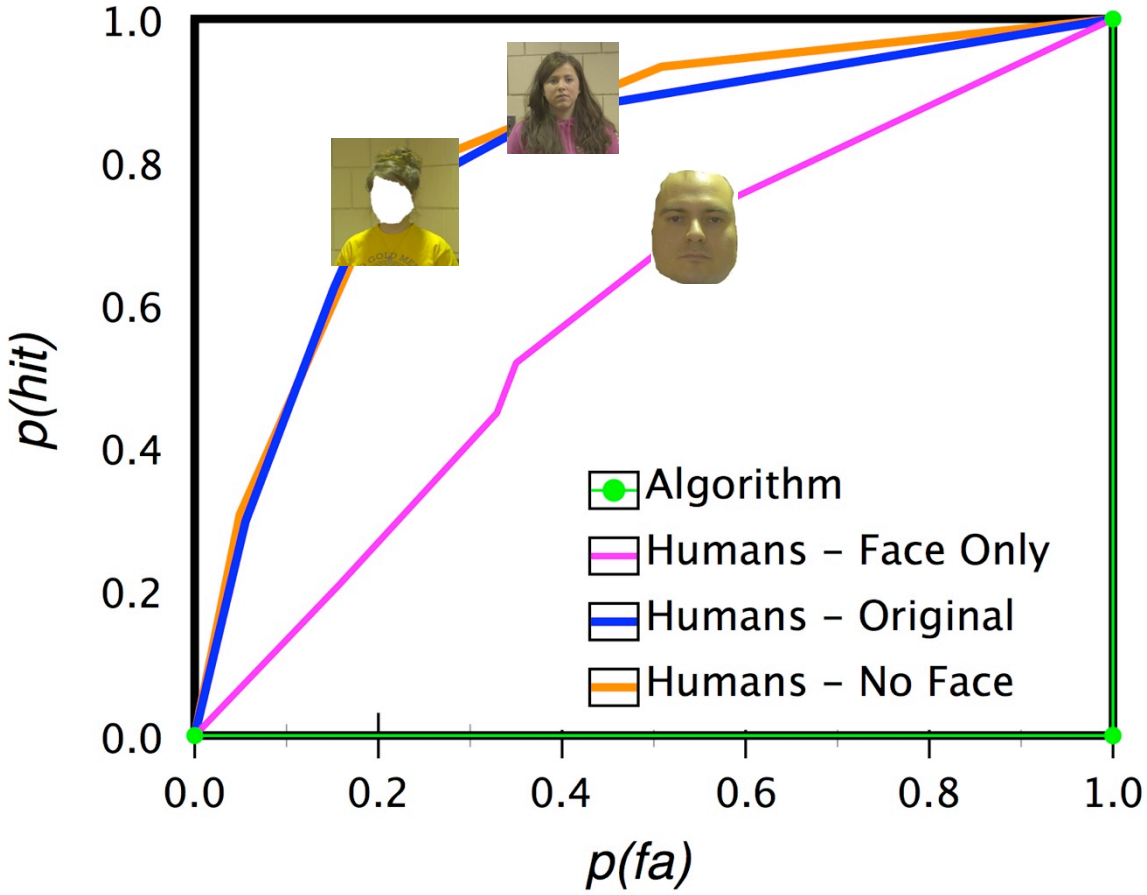
The Good, Bad, and Ugly Face Challenge

Person Identification Test

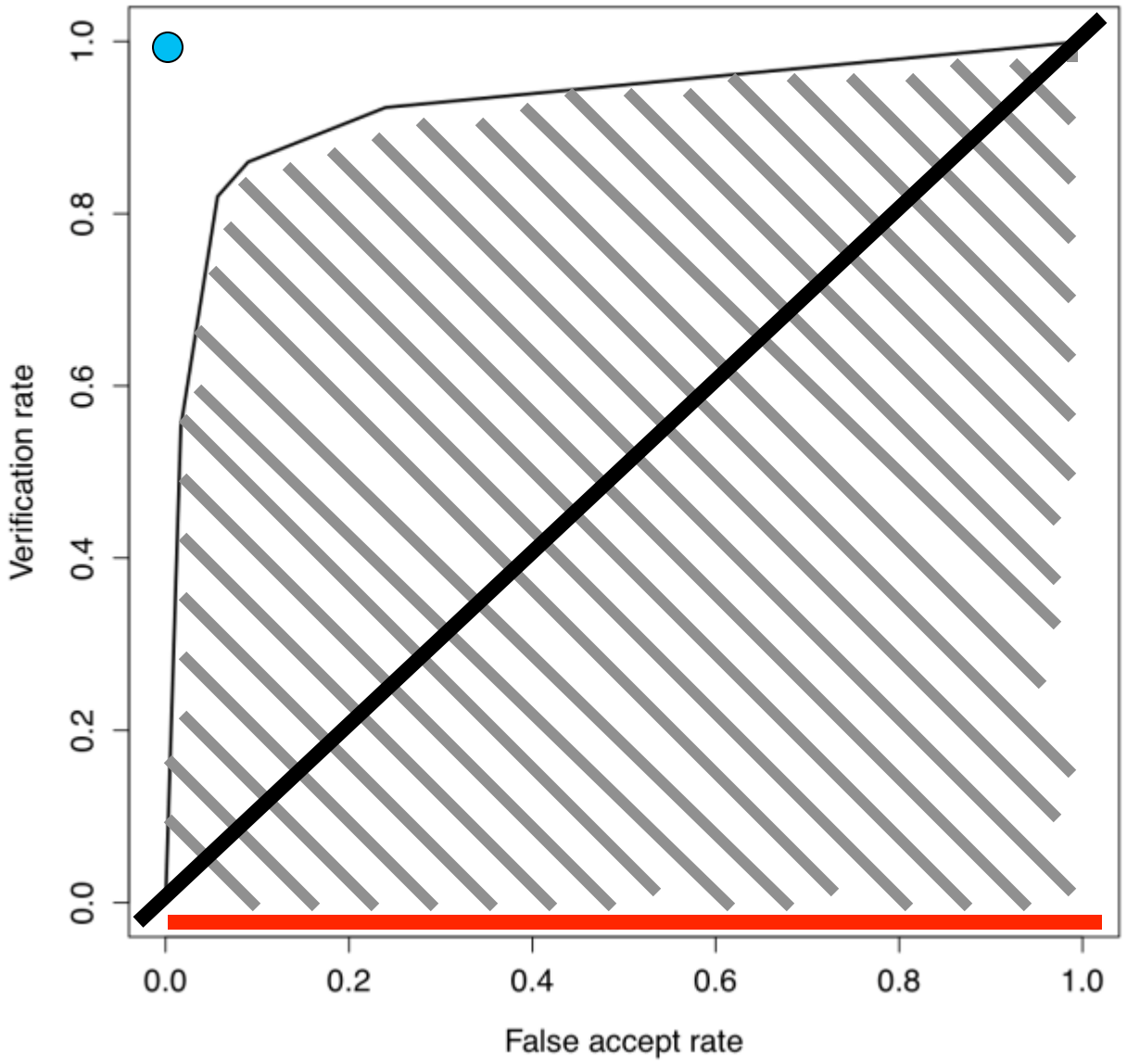
Question: What is the role of the body?



Human vs. Algorithm (100% Incorrect)



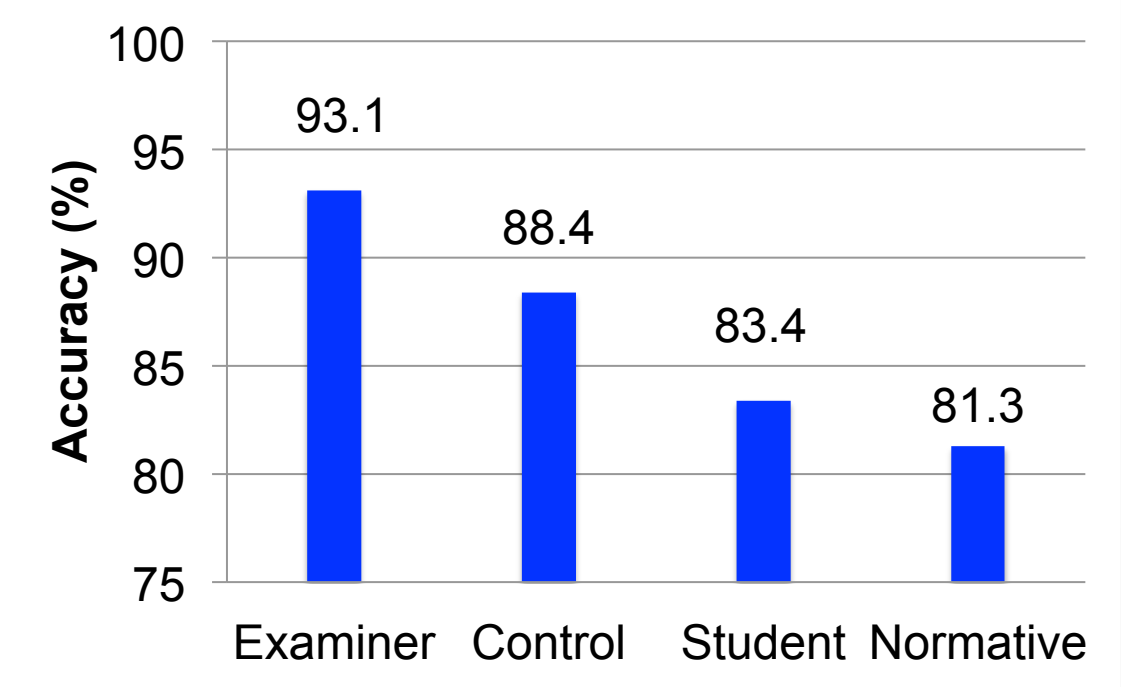
Area Under Curve (aROC)



Glasgow Face Matching Test—Results

Answer: Examiners better than normative (general) population

First known occurrence of groups better than normative



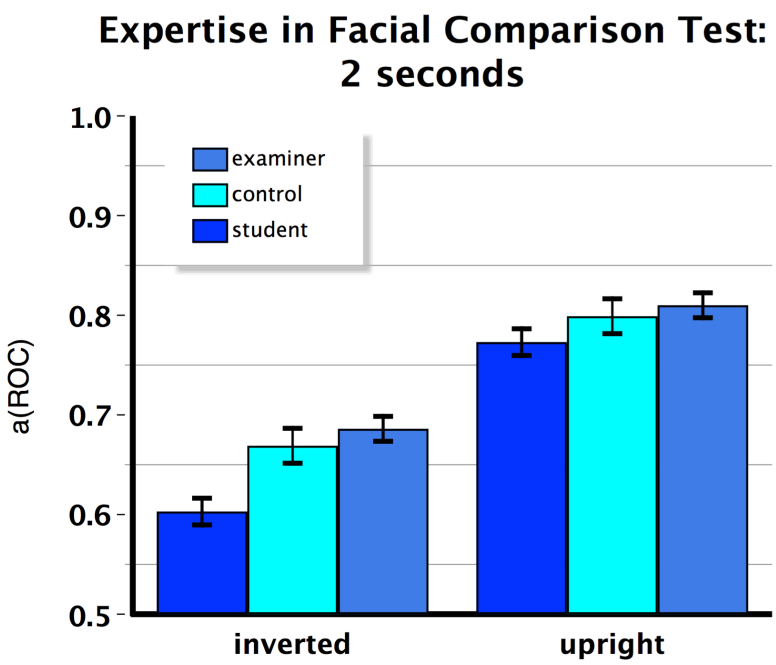
- Examiner > Normative t (219) = 6.35; p = 0.00001
- Control > Normative t (206) = 2.77; p = 0.006

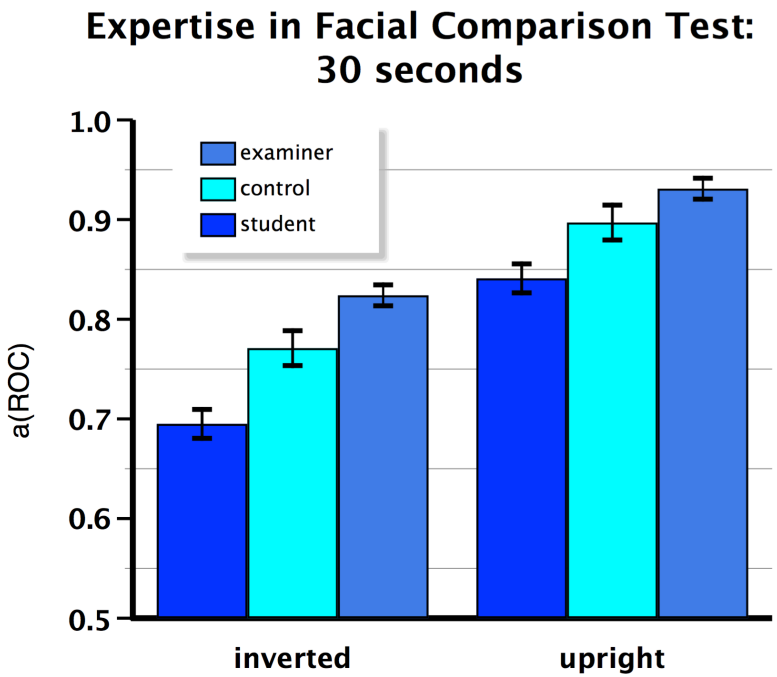
Expertise in Facial Comparison Test—Results with aROC

Answers: 30 seconds better than 2 seconds

Order of Examiners, Controls, Students

Upright better than Inverted

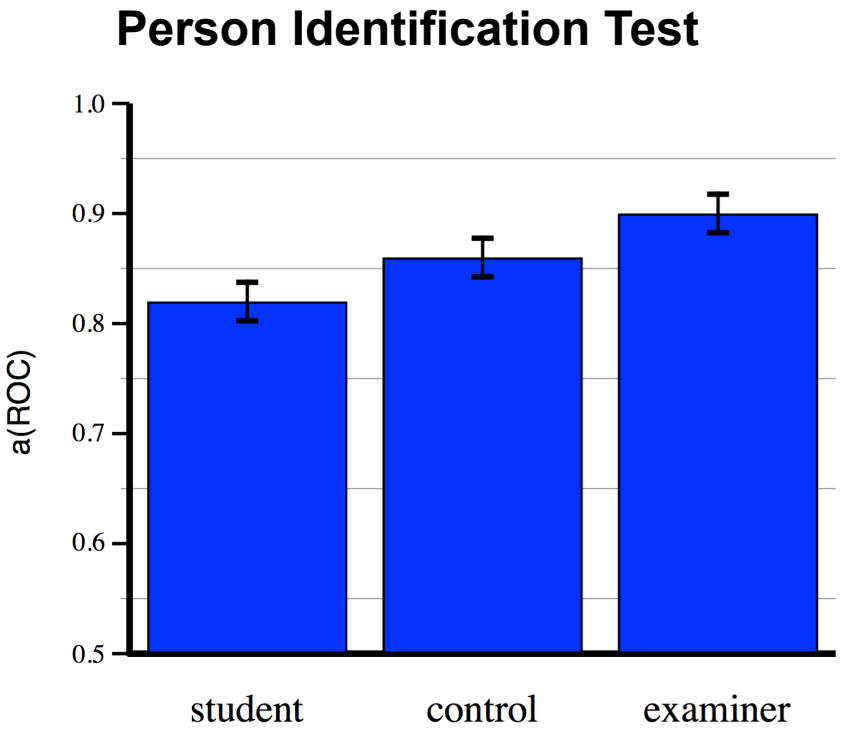




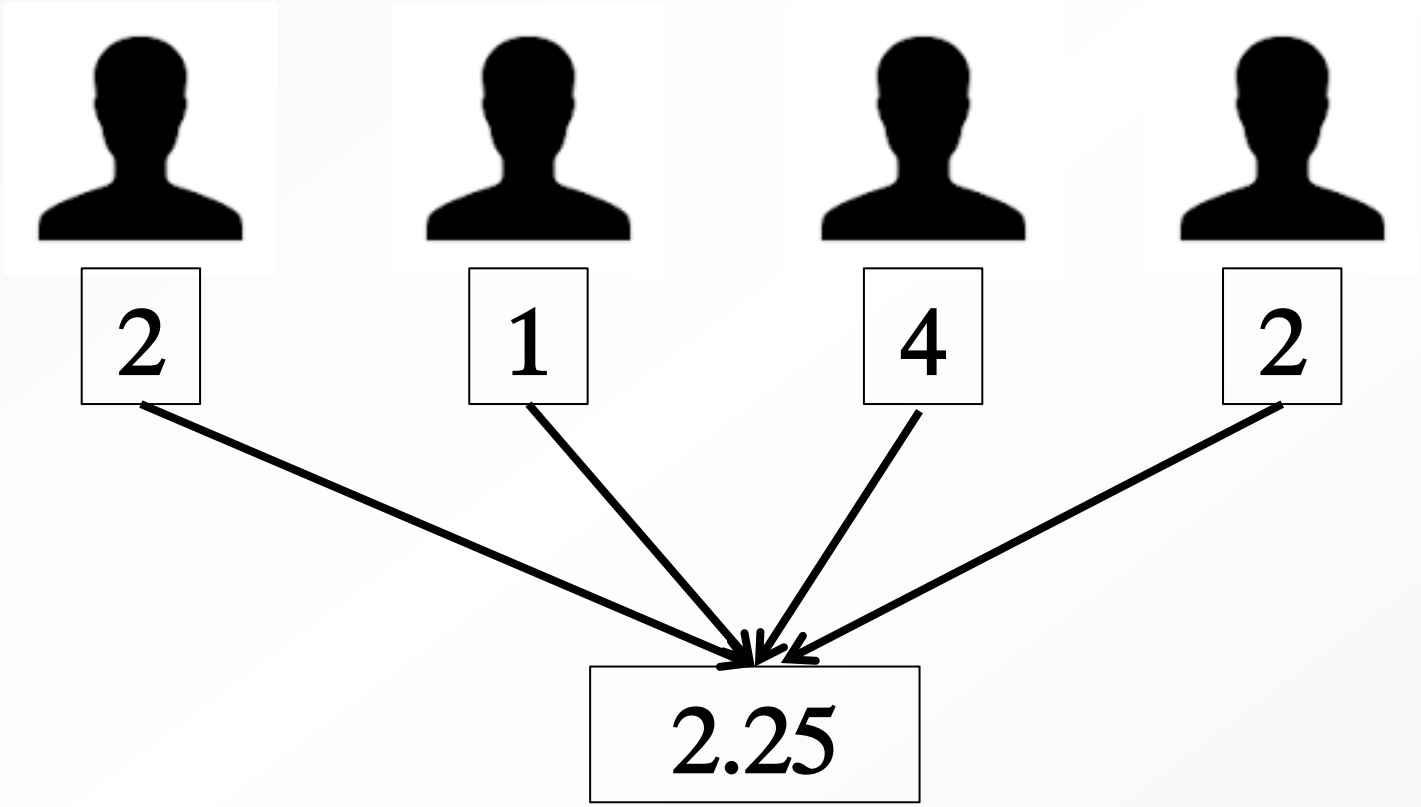
Person Identification Test—Results

Answers: Examiners appear to use all information

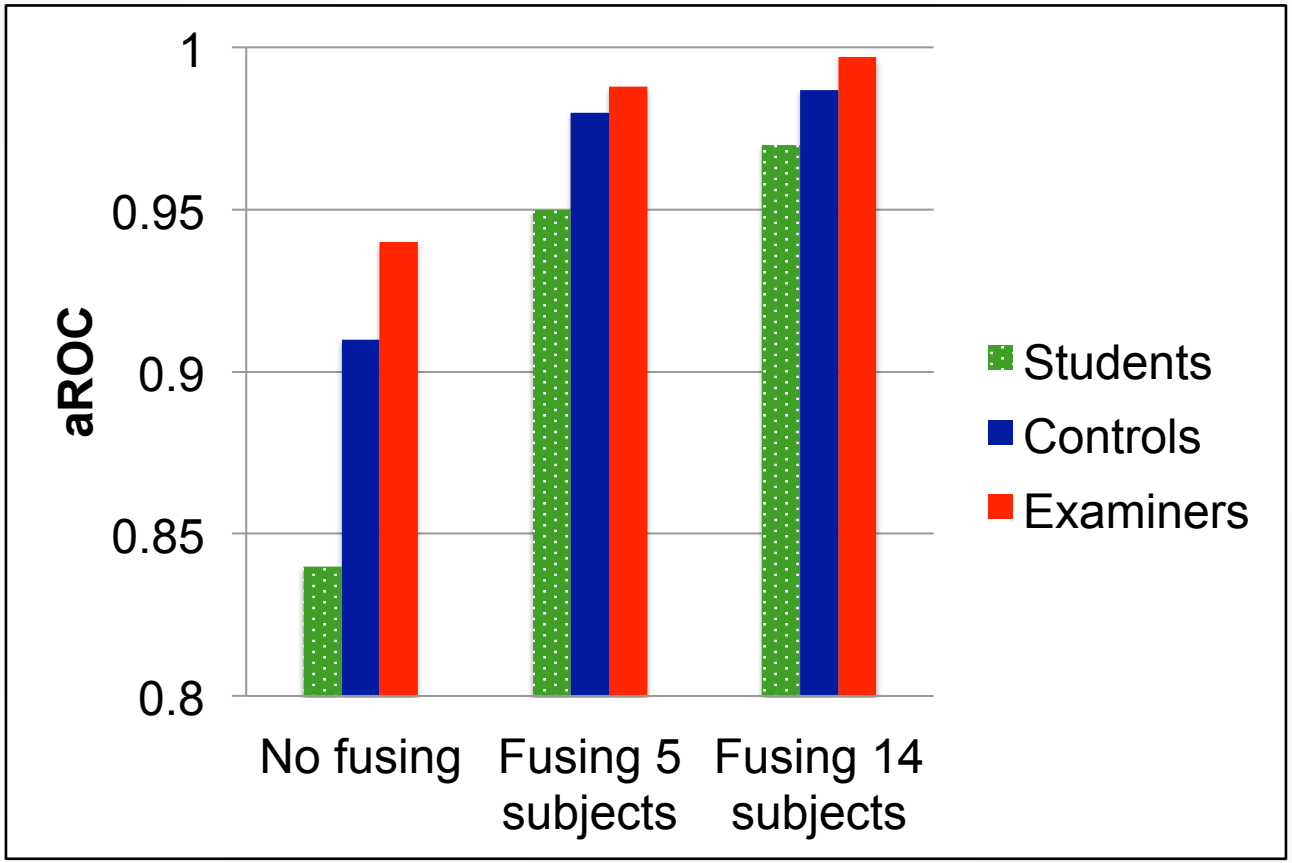
Order of Examiners, Controls, Students



Fusing Human Ratings



Fusing Human Ratings



Overall Results

- On all six tasks, ordering of performance by area under the ROC

Examiners > Controls > Students

- Statistical inference
  - Examiners > Controls
  - Controls > Students
  - Wilcox sign test, (t(5) = 4.85, p-value = .0313)]

Conclusions for Perceptual Study

- Examiners out perform general population
- Order of accuracy: Examiners, Controls, and Students
- Time matters
  - 30s better than 2s
- Face and person recognition
  - All identity cues
- Fusion is effective
- Experiments suggest that examiners recognize face differently

PLOS ONE

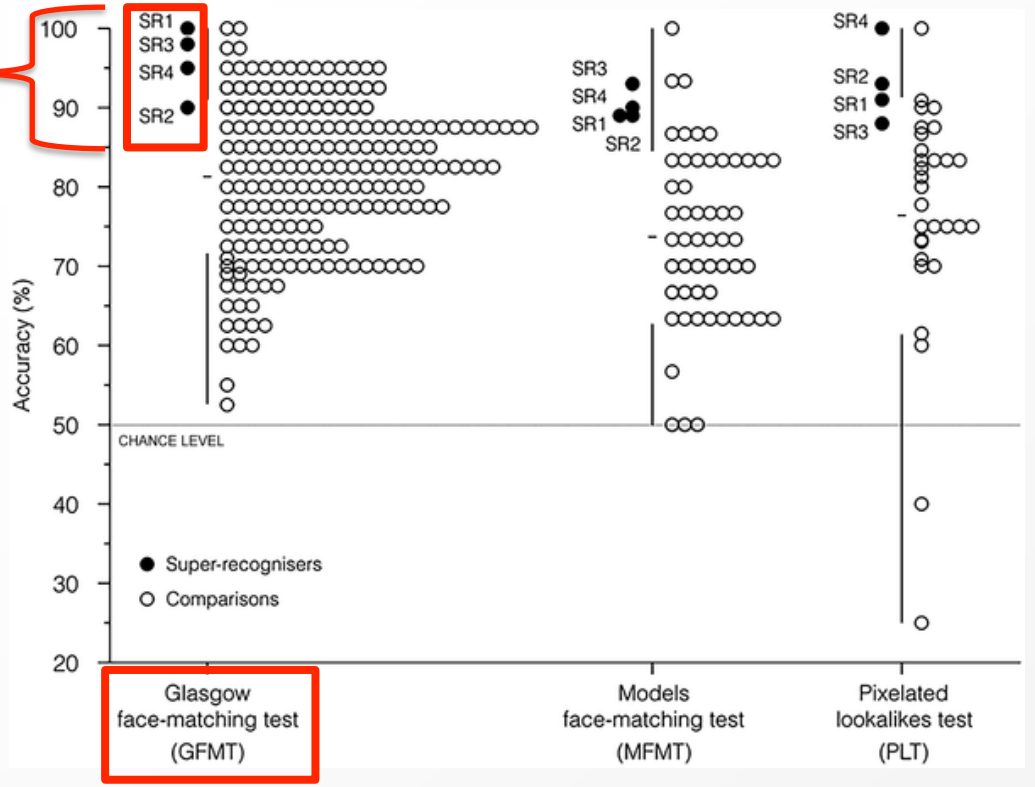
RESEARCH ARTICLE

Face Recognition by Metropolitan Police Super-Recognisers

David J. Robertson, Eilidh Noyes, Andrew J. Dowsett, Rob Jenkins, A. Mike Burton*

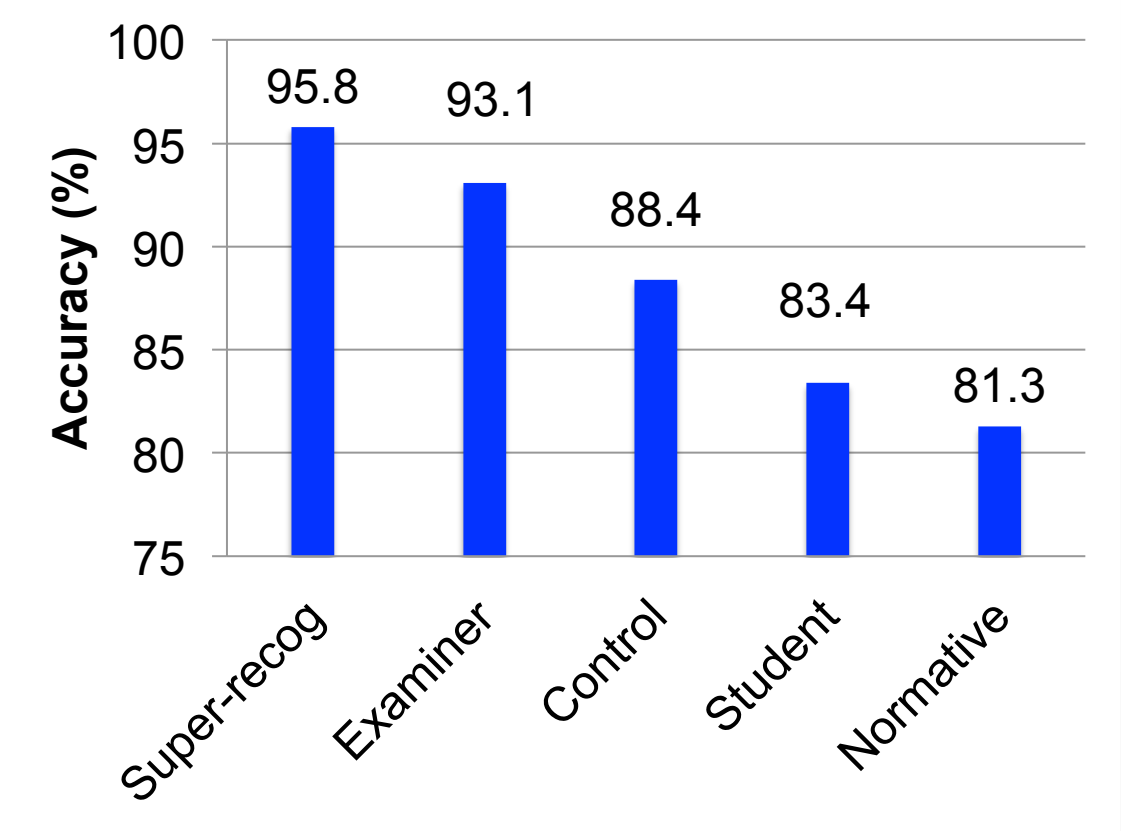
Fig 2. Performance of police super-recognisers and comparison viewers.

Mean accuracy of super-recognizers 95.8% on GFMT



Glasgow Face Matching Test—Results

Analysis with super-recognizers added



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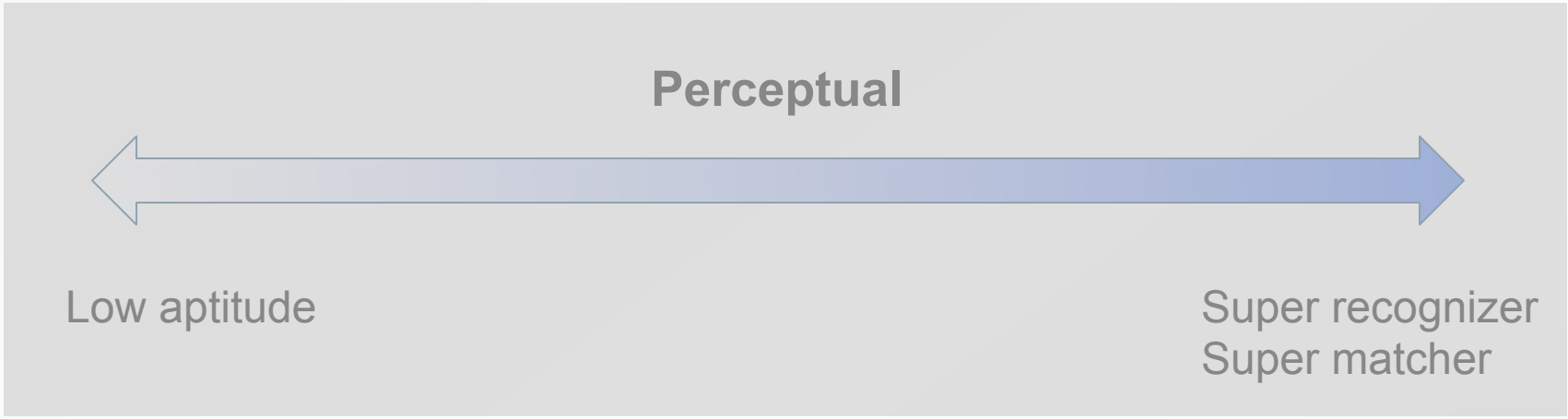
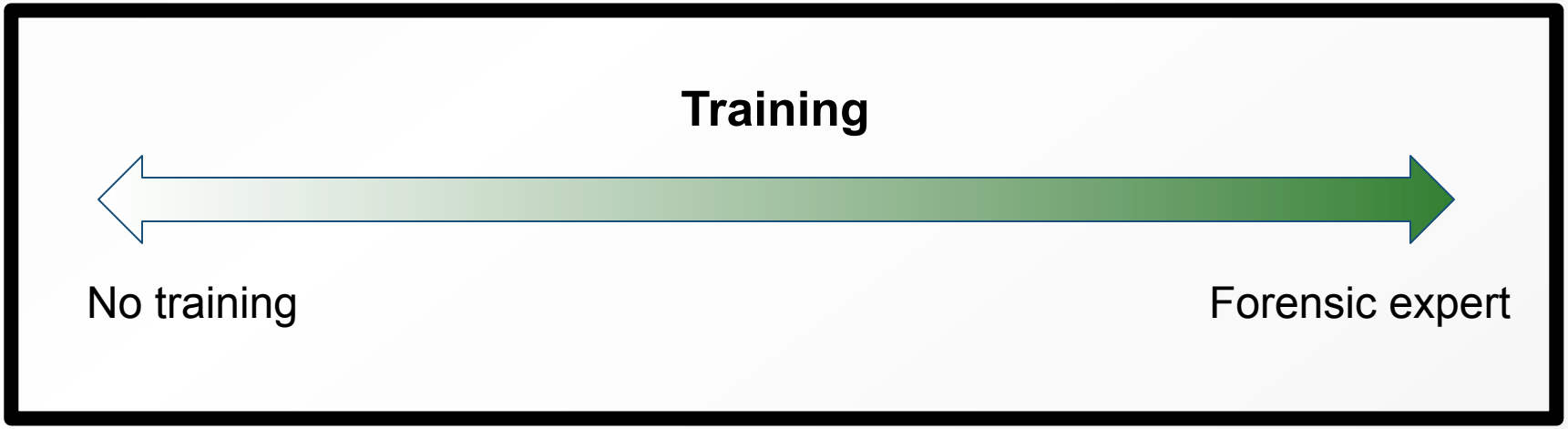
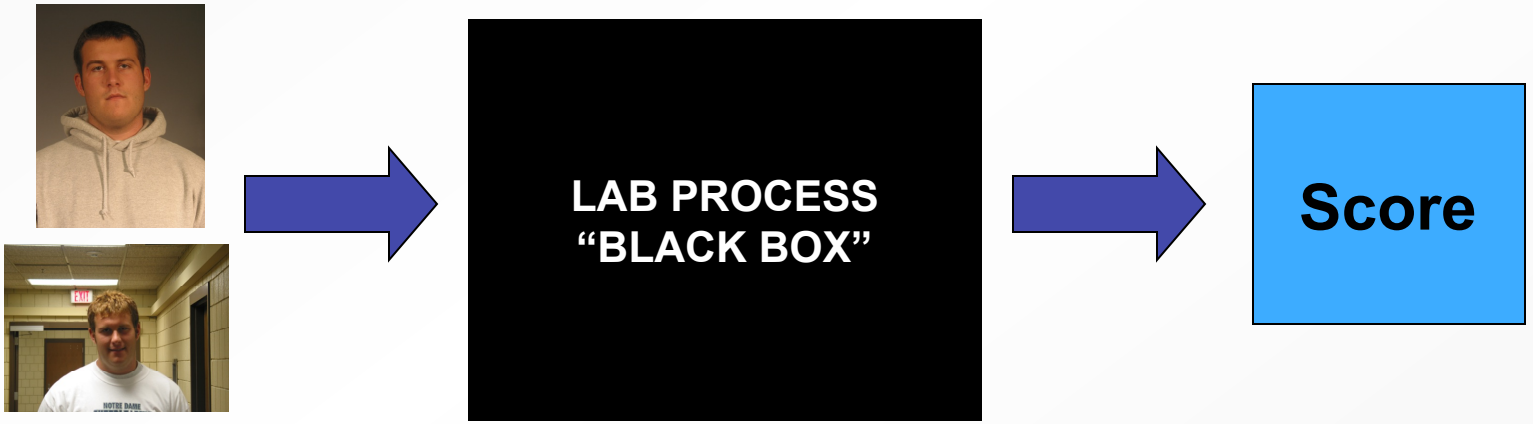
Two Dimensions of Recognition





Next Facial Forensic Study

- Measure performance of Forensic Facial Examiners using their tools and process(es).



- Examiners can use lab procedures, tools, methods, resources, and time schedule (more or less).

The Black-box Team

- NIST
  - Dr. P. Jonathon Phillips
  - Amy Yates
- U of Texas at Dallas
  - Prof. Alice J. O'Toole
- U of New South Wales
  - Dr. David White

Overview of Black-box Study

- This is an overview
  - Details of the study are in the NIST approved consent form
- Status: **Recruiting**
  - Volunteers from FOUR continents

General Rules

- Survey questionnaire
- 7 point comparison scale
- 5 point difficulty of comparison scale
- 20 pairs of face images
- 3 months to complete comparisons
- Option to get performance on the test

Three Subject Groups

- Facial forensic examiners
- Non-examiner face experts
- Fingerprint examiners with no face experience

Comparison Scale

+3	The observations strongly support that it is the same person
+2	The observations support that it is the same person
+1	The observations support to some extent that it is the same person
0	The observations support neither that it is the same person nor that it is different persons
-1	The observations support to some extent that it is not the same person
-2	The observations support that it is not the same person
-3	The observations strongly support that it is not the same person

Difficulty of Comparison

Easy	The comparison was easier than most facial comparisons.
Moderate	The comparison was a typical facial comparison.
Difficult	The comparison was more difficult than most facial comparisons.
Very difficult	The comparison was unusually difficult, involving significant photometric, illumination, or pose changes, other red flags.
Not possible	The comparison was virtually impossible, due to a lack of detail in the image(s).

How Do I Participate?

- We are Recruiting and Enrolling
- Recruiting email to IBPC attendees
- Interested participants please email me
  - jonathon@nist.gov

Questions