

National Academy of Science
Committee for the Evaluation of the Needs of the
Forensic Science Community

SWGFAST

Scientific Working Group on Friction Ridge
Analysis, Study and Technology



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Overview

- ◆ Six questions:
 - ◆ 1) Average latent print examination
 - ◆ 2) AFIS
 - ◆ 3) Context information
 - ◆ 4) Bias
 - ◆ 5) Error rates
 - ◆ 6) Variability among examiners

Question 1

Q1

Average Exam

Seven phases

An Average Examination

- ◆ In the U.S., significant variation
- ◆ Seven phases:
 - ◆ Collection of the evidence at the scene
 - ◆ Processing the evidence
 - ◆ ACEV
 - ◆ AFIS
 - ◆ Documentation of evidence
 - ◆ Report of findings
 - ◆ Testimony

Question 2

Q1

Average Exam

Seven Phases

Q2

AFIS

AFIS

- ◆ AFIS record information
 - ◆ Criminal history
 - Fingerprint card
 - Charges
 - Descriptors
 - ◆ AFIS record
 - Fingerprint images
 - Fingerprint classification information
 - Unique identifier (name, numbers)

Latent Entry

Q1

Average Exam

Seven Phases

Q2

AFIS





Current Editing Mode

Edit **Minutiae**

Delete
Core

Delete
Delta

Delete
Ref. Core

Delete
Ref. Delta

☒ Display Minutiae

☒ Display Core/Delta

Fingerprint Characteristics

Primary Finger: **None**

Alt Finger 1: **None**

Alt Finger 2: **None**

Alt Finger 3: **None**

Clear All Finger Numbers

Pattern: **Whorl**

Reference: **Unknown**

☐ Core/Delta Plus

☐ Ref. Core/Delta Plus

Search Options

Descriptors: **Prompt...**



Current Editing Mode

Edit Minutiae

Delete Core Delete Delta

Delete Ref. Core Delete Ref. Delta

☒ Display Minutiae


☒ Display Core/Delta

Fingerprint Characteristics

Primary Finger: None

Alt Finger 1: None

Alt Finger 2: None

 Alt Finger 3: None

Clear All Finger Numbers

Pattern: Whorl

Reference: Unknown

☐ Core/Delta Plus

☐ Ref. Core/Delta Plus

Search Options

Descriptors: Prompt...



Case Information
 Case ID : 000000000000
 Resp ID : 000000001207
 # Resp : 15
 # Lists : 1

Prev
 Next
 Ident
 Non Ident

Resp List Lat v. ICF
 Print Num 1

Disposition Case Cancel Verification

Case Selection Control
 Status : Case 1 of 1



Match Report (Lat v. ICF)

1)	059000001357	2480	F#2
2)	051030906812	1785	F#2
3)	011000122374	1740	F#2
4)	031001414374	1715	F#2
5)	031083008427	1690	F#2
6)	031002049862	1680	F#2
7)	011000096119	1655	F#2
8)	031083010114	1640	F#2
9)	031098017786	1620	F#2
10)	031094017238	1615	F#2
11)	021002000355	1600	F#2
12)	061009420428	1575	F#2
13)	021000016110	1570	F#2
14)	021091002789	1565	F#2

000011213124
 000000000000
 000000100000
 000010100000
 000000100000
 000000000000
 000000100000
 000010100000

Filter
 Query Lat
 Expand
 Cancel Range

Quest

Q1

Average Exam



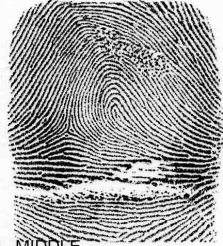








Seven Phases

Q2

AFIS

ESC
école

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LEAVE BLANK 031007089655 SID: MN 07089655		TYPE OR PRINT ALL INFORMATION IN BLACK LAST NAME: STE FIRST NAME: JEF MIDDLE NAME:				9703672				
ARRESTEE'S SIGNATURE		ALIASES:				REEL: 902010708053				
OFFICIAL'S SIGNATURE 20070728						FRAME: OTHER DATES OF BIRTH (MMDDYYYY)				
US CITIZEN: Y / N COUNTRY:		ALIASES:								
PLACE OF BIRTH AR		PHOTO AVAILABLE Y / N		INTERSTATE TRANSFER?						
SCARS, MARKS, TATTOOS	MISCELLANEOUS NUMBERS 429712353	DATE OF BIRTH (MMDDYYYY) 19880415	SEX M	RAC W	HGT 510	WGT 155	EYES BRO	HAIR BLK	SKIN	
 1. R. THUMB		 2. R. INDEX		 3. R. MIDDLE		 4. R. RING		 5. R. LITTLE		
 6. L. THUMB		 7. L. INDEX		 8. L. MIDDLE		 9. L. RING		 10. L. LITTLE		
LEFT FOUR FINGERS TAKEN SIMULTANEOUSLY					L. THUMB		R. THUMB		RIGHT FOUR FINGERS TAKEN SIMULTANEOUSLY	
										

Quest

Q1

Average Exam
Seven Phases

Q2

AFIS

ORIGINATING AGENCY-CAG	ORIGINATING CASE NO -OCA	DATE OF ARREST-DOA 20070727	ARREST DISPOSITION -ADN <i>SSN:</i> <i>OLN:</i>
ORIGINATING AGENCY NAME-ORA	ARRESTING AGENCY NCIC -ORI MN0020300	DATE OF OFFENSE-DOO	
	LOCAL IDENT NO - LID 0708398	ALIAS DOB	ALIAS NAME
<i>Supervisory Status Date:</i> <i>Supervisory Status Description:</i>			
		REASON FOR CAUTION	SCARS, MARKS, TATTOOS:

OFFENSES				TREAT AS ADULT YES _____	
205	07177597	N	TRAF-DRIVING AFTER REVOCATION {171-24-2}	MNSS171-24-2	MN0020300
				N	20070727
205	07177597	N	GOV'T-FALSE NAME TO POLICE OFFICER {609-506}	MNSS609-506	MN0020300
				N	20070727
205	07177597	N	POSS OF DRUG PARAPHERNALIA {152-093}	MNSS152-093	MN0020300
				N	20070727

Question 3

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case information

Available case information

- ◆ As in Question #1, it depends
- ◆ Examiner could have no information
- ◆ Examiner could be involved from beginning to end
- ◆ We maintain:
 - ◆ We need relevant case information
 - Manage case load
 - Decisions within a case (big picture)
 - For proper analysis of (complex) latent print
 - ◆ We recognize inherent potential (negative) bias influence

Question 4

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case info

Q4

Bias

Bias

- ◆ Context bias
 - ◆ Case information
- ◆ Confirmation bias
 - ◆ Trusted colleague gives you a declared identification
- ◆ Potential for bias exists
 - ◆ Dror's work
 - ◆ Schiffer (2007):
 - Analysis phase is robust to bias
 - ◆ Langenburg (*in prep.*):
 - Experts more resistant to bias toward individualization
 - Could be more easily influenced towards inconclusive and exclusion opinions

Question 4

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case information

Q4

Bias

Bias

‘systematic blind testing is not necessary during most routine examinations; it is time consuming and unnecessarily consumes significant personnel resources. Rather, a verification structure *should cater to potentially problematic latent prints and cases.*’

Margot, P., Champod, C., Lennard, C., Stoilovic, M. Fingerprints and Other Ridge Skin Impressions. Boca Raton: CRC Press, 2004, 200.

Question 5

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case information

Q4

Bias

Q5

Variability

Examination Variation

- ◆ Expert variation (range of skills)
- ◆ Agency variation
 - ◆ Training, continuing education
 - ◆ Multiple duties
 - ◆ Accredited labs, certified examiners
- ◆ Method variation

Question 5

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case information

Q4

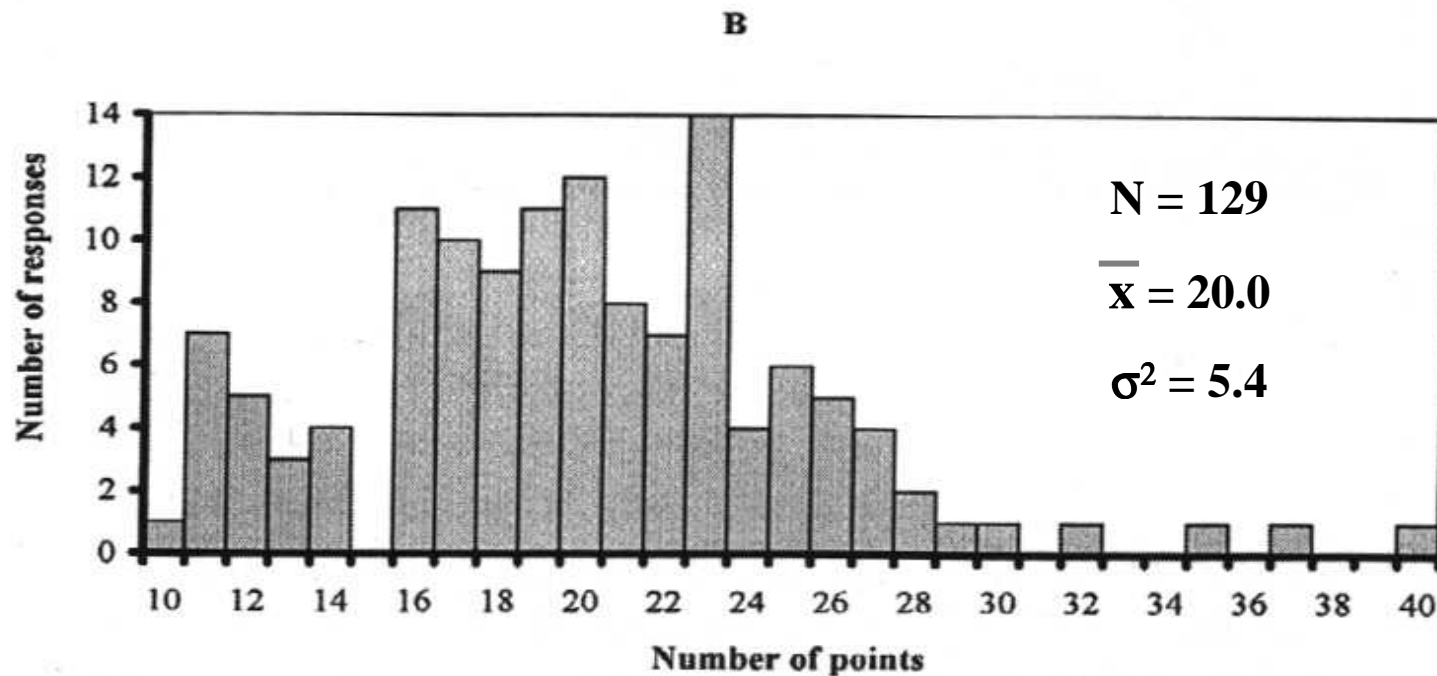
Bias

Q5

Variability

Evet & William

Examiner Variation



- ♦ Evett, I.; William, R. *A Review of the Sixteen Points Fingerprint Standard in England and Wales. Proceedings of the International Symposium on Fingerprint Detection and Identification 1995*, Eds. Almog, J.; Springer, E. 287-304.

Question 5

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case information

Q4

Bias

Q5

Variability

Evet & William

Examiner Variation

- ◆ For that trial,
99% experts* declared a (correct) positive identification
1% declared insufficient (inconclusive)

**(129/ 130 experts declared a match. These experts had a minimum of 10 years of experience, working as experts in England or Wales)*

- ◆ *Evet, I.; William, R. A Review of the Sixteen Points Fingerprint Standard in England and Wales. Proceedings of the International Symposium on Fingerprint Detection and Identification 1995, Eds. Almog, J.; Springer, E. 287-304.*

Question 5

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case information

Q4

Bias

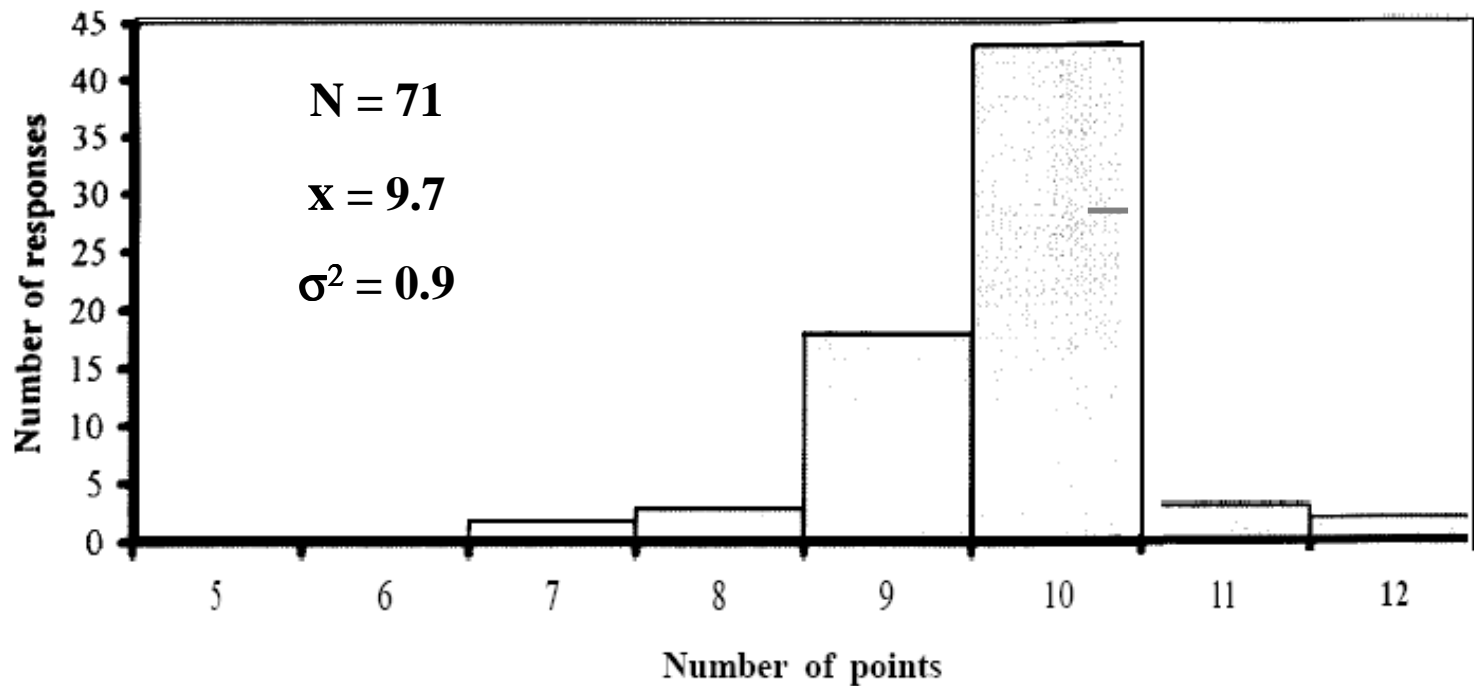
Q5

Variability

Evetts & William

Examiner Variation

H



- ♦ Evett, I.; William, R. *A Review of the Sixteen Points Fingerprint Standard in England and Wales. Proceedings of the International Symposium on Fingerprint Detection and Identification 1995*, Eds. Almog, J.; Springer, E. 287-304.

Question 5

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case information

Q4

Bias

Q5

Variability

Evet & William

Examiner Variation

- ◆ For that trial,
54% experts* declared a (correct) positive identification
38% declared insufficient (inconclusive)
8% declared an exclusion (incorrect)

- ◆ *Evet, I.; William, R. A Review of the Sixteen Points Fingerprint Standard in England and Wales. Proceedings of the International Symposium on Fingerprint Detection and Identification 1995, Eds. Almog, J.; Springer, E. 287-304.*

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case information

Q4

Bias

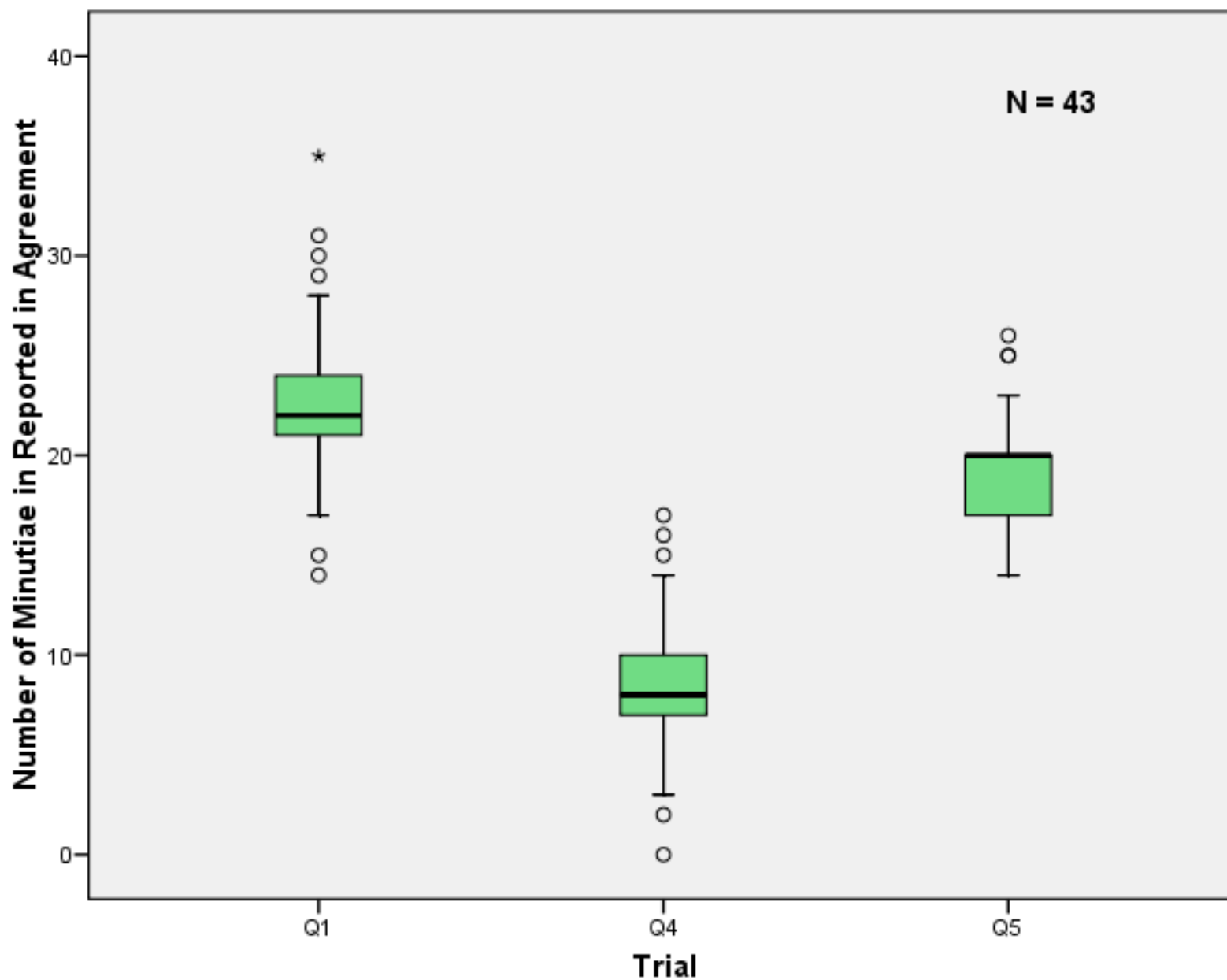
Q5

Variability

Evet & William

Langenburg et.al

Number of Minutiae Reported by Expert Participants for Three Fingerprint Comparison Trials



Question 5

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case information

Q4

Bias

Q5

Variability

Evet & William

Langenburg et.al

Examiner Variation

◆ For three trials:

Q1-100% experts declared a (correct) positive identification

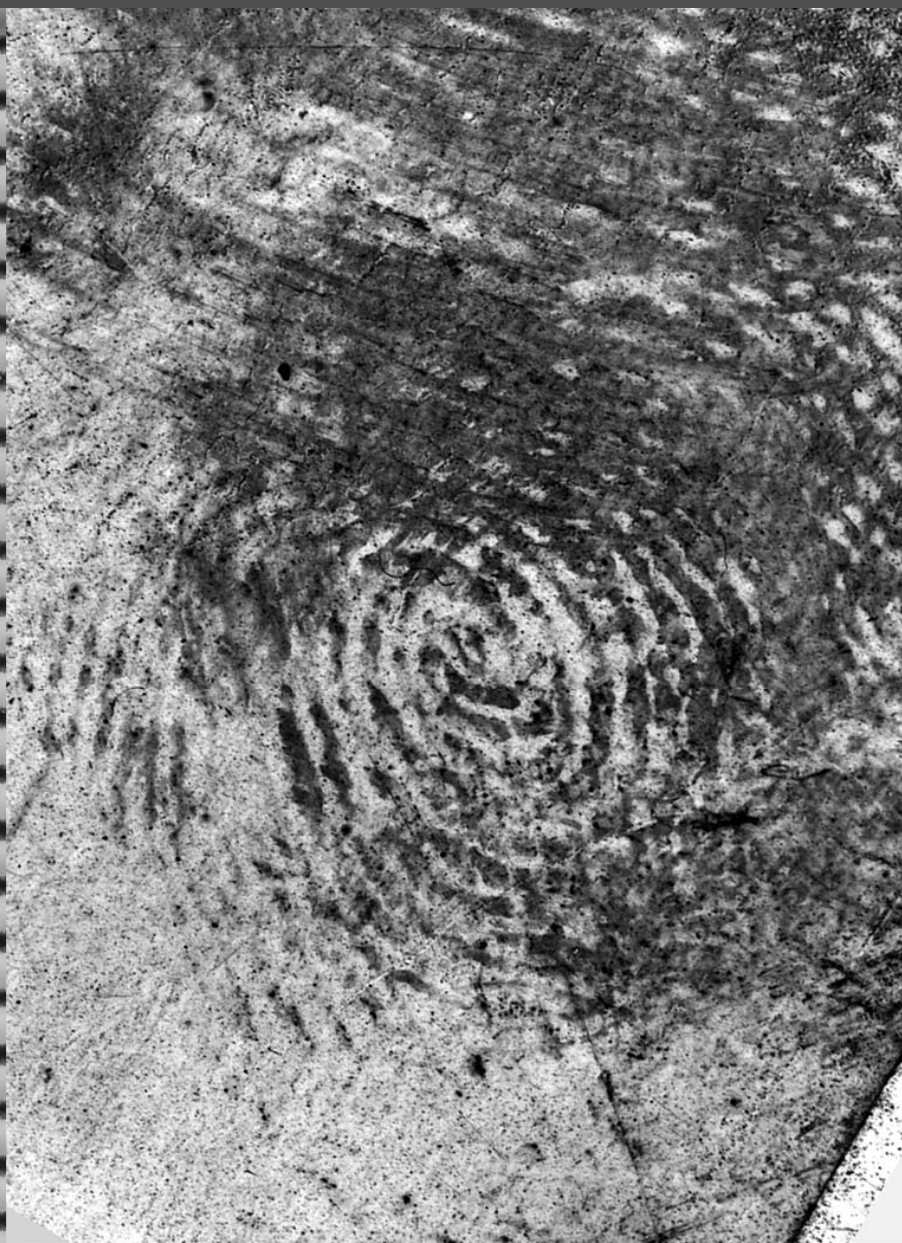
Q5-100% experts declared a (correct) positive identification

Q4- 7%* erroneously excluded

41% inconclusive

51% positive identification (correct)

*Note: values rounded and therefore do not add to 100%



Q4

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case information

Q4

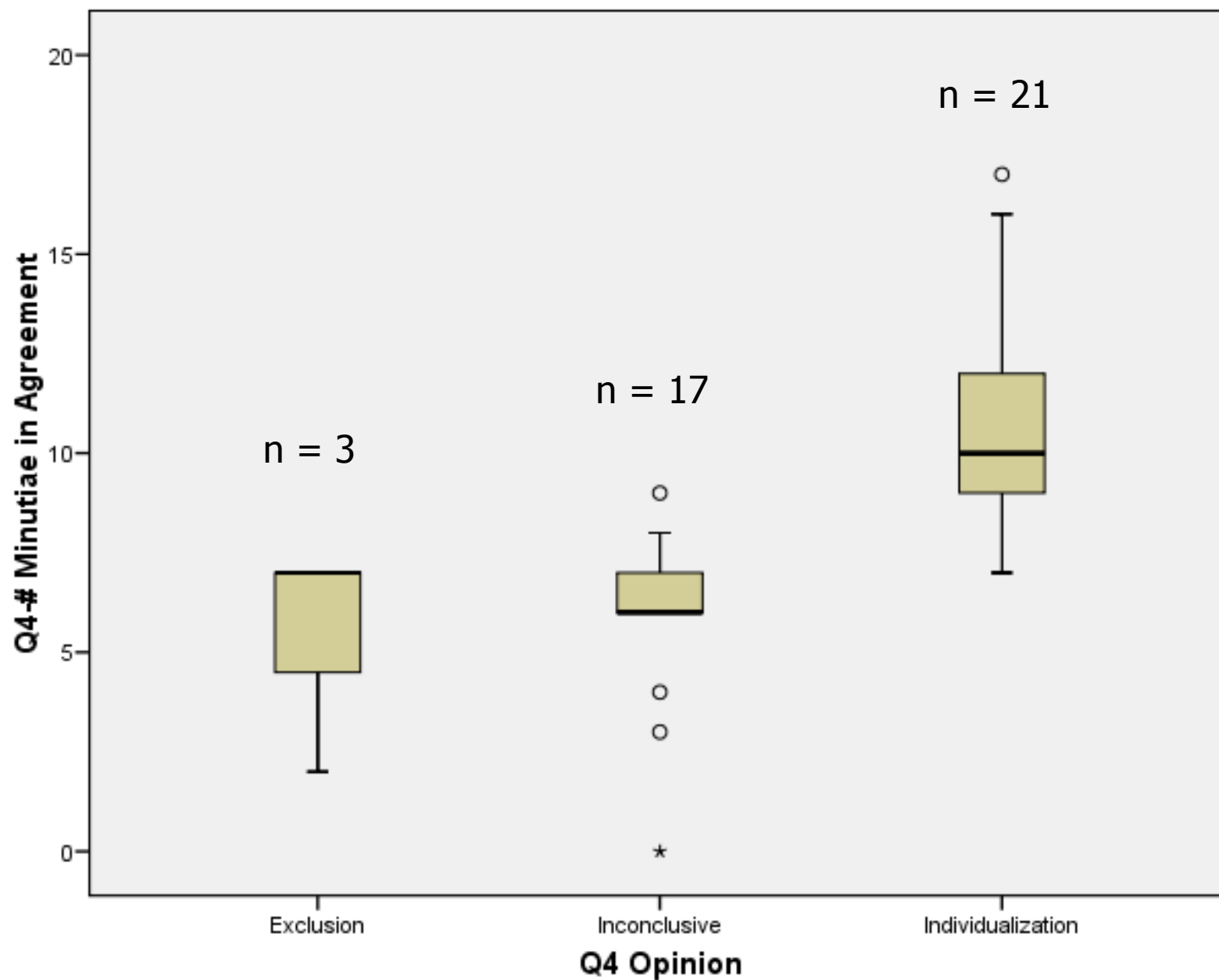
Bias

Q5

Variability

Evet & William

Langenburg et.al



Question 5

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case information

Q4

Bias

Q5

Variability

Evet & William

Langenburg et.al

Examiner Variation

- ◆ Can be significant variation among:
 - ◆ Expert ability
 - ◆ Agency standards and training
 - ◆ Method application
- ◆ Sometimes this variation is critical to the examination outcome
- ◆ Sometimes it's not
- ◆ Appears to be most significant in 'complex cases'

Question 6

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case information

Q4

Bias

Q5

Variability

Evet & William

Langenburg et.al

Q6

Error Rates

Error Rates

- ◆ H_0 = The latent print was not made by X
- ◆ H_1 = The was made by X

	If H_1 is false (same source)	If H_0 is true (different source)
Accept	Type 1	No match
Reject	Match	Type 2

- ◆ Type 1 = Erroneous identification
- ◆ Type 2 = Erroneous exclusion

Question 6

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case information

Q4

Bias

Q5

Variability

Evet & William

Langenburg et.al

Q6

Error Rates

Error Rates

♦ Research:

- ♦ Wertheim, Langenburg, and Moenssens (2006)
- ♦ Gutowski (2007)
- ♦ Evett & Williams (1995)
- ♦ Langenburg (two unpublished studies)

♦ Other sources:

- ♦ Proficiency tests
- ♦ Cole (2005)

Thank-you

Q1

Average Exam

Seven Phases

Q2

AFIS

Q3

Case information

Q4

Bias

Q5

Variability

Evet & William

Langenburg et.al

Q6

Error Rates

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- ◆ Questions?
- ◆ Contact me for additional information, articles, or resources:
- ◆ (651) 793-2967
- ◆ glenn.langenburg@state.mn.us